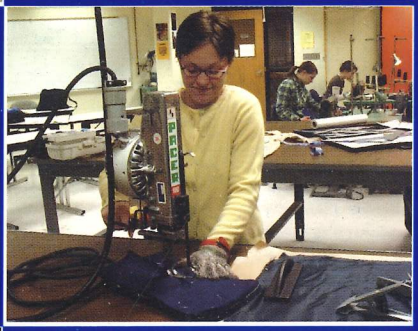
University of Wisconsin-Stout

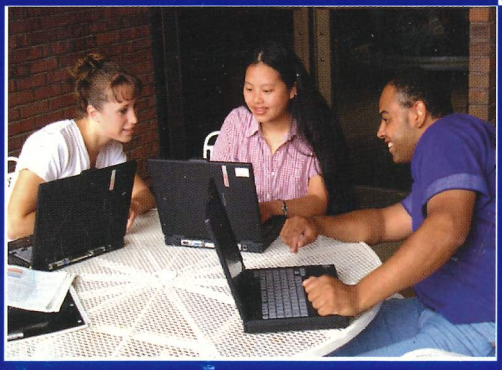
Journal of Student Research

Volume III, 2004

Learning



Experience



Opportunity

University of Wisconsin-Stout

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Stout Solutions – Research Services
University of Wisconsin-Stout
152 Vocational Rehabilitation Building
Menomonie, WI 54751
(715) 232-1126
http://www.uwstout.edu/rps/uwsjsr

Forward

Welcome to the 3rd edition of the Journal of Student Research. The University of Wisconsin-Stout is actively engaged in promoting undergraduate and graduate research within the Special Mission:

"UW-Stout is characterized by a distinctive array of programs leading to professional careers focused on the needs of society. These programs are presented through an approach to learning which involves combining theory, practice and experimentation. Extending this special mission into the future requires that instruction, research and public service programs be adapted and modified as the needs of society changes."

The Journal of Student Research continues to promote and showcase scholarly and applied research in both electronic and print formats carrying out the commitment to a fully integrated electronic campus. The online version has provided access to the world through search engines which have provided another avenue for students, faculty, and thus, programs, to be connected to a variety of expertise seekers and connectors. Information and access is the key to our students' successful applied research experience.

At the University of Wisconsin-Stout, the Journal of Student Research is a student endeavor. The following student units have contributed to this publication; Cover Design, Layout and Printing provided by the Graphic Communication Management students, Editing provided by the Applied Communication Program, and Overall Journal management by Research Services.

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Contents

Retracting from Traditional Needles

Travis J. Mueller, Packaging

Retractable syringes were developed to help fight against accidental needle sticks that occur in hospitals and medical centers worldwide. The development of a syringe that automatically retracts just after use puts the person performing the injection (or draw) in less harm of sticking themselves with the spend needle. Protecting the person performing the procedure from the possibility of being infected with tainted blood would be the major advantage of safer syringes.

There are four key advantages to implementing systems and procedures that call for the use of safety or retractable syringes. First, the lowered risk of accidentally being stuck. Second, the cost advantages hospitals find in not having to pay for lost wages, treatment, and/or surgery to persons stuck. Third, new laws and regulations are beginning to require the use of these devices. Finally, users find savings in training and disposal associated with safety syringes.

Keywords: Retractable, Syringe, Needle, Safety, Cost Savings, Laws, Regulations, Disposal, Training

Advised by Dr. Claire K. Sand 45

Plastic Sandwich

Nate Engebos, Packaging Engineering

This article covers the benefits of co-injection molding and specifically the Twinshot, co-injection system. This system was developed by Twinshot Technologies, and is a system that can be retrofitted to conventional injection molding machines. The process uses a single barrel to inject two materials simultaneously into a mold. The co-injection system uses off spec, regrind, or recycled material as core filler and then y encapsulates the core with a virgin material. That results in a huge savings on material costs. Since the system can be fitted to an injection machine, there is no need to make floor space or sell old machines. Using the Twinshot system, a molder could possibly save up to $42,000 per year on material costs alone. Also, the system is significantly less expensive than other conventional co-injection systems, thus reducing overhead costs.

Keywords: Co-Injection, Sandwich Molding, Twinshot Technologies, Joel Thompson, Multi-Material Molding, Single Barrel, Retro-fitted, Fountain Flow, Co-Injection Molding

Advised by Dr. Claire K. Sand 55

How to Use Color in Food Packaging

Rob Kaszubowski, Packaging Engineering

In society today, there is a continuous revolution in the purchase decisions of consumer food products. With competition among food manufacturers so close, packaging professionals must find a way to gain an edge for their company. Color can be the key to give them an advantage. By performing basic research regarding the target demographic group, packaging professionals can use color to sway the consumer's buying decision. However, it is important to remember that colors do not possess the same meanings in every culture. By failing to research these aspects, companies can end up with a product failure that will brand them for years to come. By performing basic color research, packaging professionals will keep their customers continuously coming back.

Keywords: Characteristic Color, Demographics, Lifestyle Groups, Color Forward Group, Color Prudent Group, Color Loyal Group, Color Effects, Color Changes

Use as Directed

Travis J. Strom, Packaging Engineering

Labeling and packaging, especially unit-dose packaging, can help patients with compliance. Hospitals reported a 70 percent decrease in errors when their pharmacies switched to bar-coded, unit-dose packaging. Most medication errors are associated with poor product packaging design, and changes to regulations are forcing engineers to re-evaluate their packaging. In June 1995, the U.S. Consumer Product Safety Commission (CPSC) voted unanimously to issue a final rule modifying the child-resistant packaging test protocols of the Poison Prevention Packaging Act of 1970. When the CPSC revised its protocol requiring that drug packages be senior friendly as well as child resistant, blister package designers were faced with a challenge. Examples of newer unit-dose packaging include the Dosepak and Surepak from the Mead Westvaco Corporation. The use of unit-dose packaging is rapidly expanding in the United States. The projected growth of both blisters and unit-dose packaging shows a wider industry acceptance of the packaging design and the willingness to protect children while not compromising ease of use. If drugs were to be placed in unit-dose packaging, patients would have a daily reminder and record of their regimens. The key to increased awareness is to convince patients, practitioners, and buyers the value of unit-dose packaging. With these new advances in material and packaging designs, unit-dose packaging will continue to grow in the medical market.

Keywords: Unit-Dose Packaging, Self-Medication, Tear-Resistant, Child-Resistant, Senior-Friendly, Calendar Packaging, Blister Packaging, Protocol

Choosing the Ideal Integrity Test

Michael Grindle, Packaging Engineering

It is essential for packagers to understand the importance of medical package integrity testing. Packagers must also understand how the growth in medical packaging is placing high demands on companies to produce safe and effective products. Understanding the various factors involved with choosing an appropriate test method will aid the packager in making the right decision. In the end, it will provide assurance of how a package/product will perform in real life situations.

Keywords: Package Integrity, Product Sterility, Non-Porous, Co-Extrusions, Laminates, Destructive Test, Non-Destructive Test

Patent Pending

Amy Baumann, Packaging Engineering

This paper gives evidence to support the claims that there are three major problems with patented packaging. The problems with patented packaging include: trade-dress disappears after the patent expires, words do not exist to describe if a patent is novel or non-obvious, and the incentive to invent is diminishing. Evidence that trade-dress disappears after the patent expires is demonstrated in several court cases. The problem associated with patents is that words do not exist to describe whether the invention is novel. Finally, the last problem discussed in the paper is the diminishing incentive to invent. Litigation costs are outrageously high and continue to increase, and the rights given to the patentee are no better than the right of the accused infringer.

Keywords: Trade-Dress, Patented Packaging, Design Patent, Utility Patent, The Patent Act, The 1946 Lanham Act

Gender Differences in Memory and Self-Esteem for Advertising

Amanda K. Hendrickson
Undergraduate, Psychology

Annie E. Slauson
Graduate Student, Psychology

Introduction

Advertisements are designed with the intention to capture the viewers' attention and to establish a place for the product in the viewers' memory. These techniques often involve various visual components (color, text, and shape) as well as the use of a familiar spokesperson. Viewer related variables may also influence whether a person pays attention to a particular advertisement. For instance, people are typically attracted to advertisements that are related to a personal current goal. However, cognitive research suggests that observing an item or event does not guarantee good memory for that item or event. Instead, the type of processing is the major determinant of memory (Eysenck & Keane 2000). Of particular importance to this study, our findings suggest that people generally have excellent recall for events or items they can relate with, which is called the self-reference effect (which will be discussed later) (Symons & Johnson 1997).

Spokespeople and their Effect

Spokespeople are often used in advertisements to help sell a product. Sometimes advertisers choose spokespeople that they believe the consumers will identify with, or someone with an average appearance. Average appearance could be defined as a person with common facial and body characteristics. They also are of an average body weight and height. Overall, this person would not have the ideal characteristics of beauty. If a consumer can identify with that person, they may feel the need for that product. In addition, average-looking spokespeople may affirm consumers in who they are, without giving the message that they need to improve their appearances by purchasing the product being sold. Other times, advertisers choose extremely attractive spokespeople and dress them in a provocative manner to draw attention to the advertisement. Often, these extremely attractive spokespeople have no direct connection to the product. The problem is that those who view these particular advertisements may believe that these spokespeople represent society's image of ideal beauty. Then they may compare themselves to the spokesperson that leads to negative consequences. Research has shown that by including these extremely attractive people in advertisements, viewers can actually feel negative about themselves. In an article written by Marsha Richins, *Social Comparison and the Idealized Images of Advertising,* she reviewed theories that gave explanations on how advertisements can lead to negative feelings towards the self. Richins researched the hypothesis that viewers compare themselves with idealized

advertising images. After exploring the previous research, evidence for comparison was found, and the results suggest that idealized images raised comparison standards for attractiveness and lowered satisfaction with one's own attractiveness (Richins 1991).

Women's Esteem and Advertising

Research about the effect of ideal images in advertising on body esteem of women has been quite prevalent. Evidence suggests that females (in particular) are negatively affected by attractive same-gender advertising images. In a study conducted by Henderson-King and Henderson-King (1997) about media effects on women's body esteem, females were exposed to slide images of models found in popular women's magazines. Individual differences and social factors that moderate these media effects were examined. The results showed that individual body status, such as weight, affected how positively or negatively women rated their own body esteem (after being exposed to ideal images). The female images portrayed in these types of advertisements are extremely uncommon and, for the most part, not obtainable to the average female. The spokespeople are often unrealistically attractive, and especially for females, unrealistically thin (Richins 1991). Because the average female's weight is far from the weight portrayed by most spokespeople, self-doubt and inadequacy stem from this comparison, which leaves females to desire an unattainable image (Lasch & Freedman 1984).

Men's Esteem and Advertising

Men can also be negatively affected by advertising that portrays ideal body images. An example of this is found in a study conducted by Conner, Grogan and Williams (1996). It investigated the effects of viewing same-gender photographic spokespeople on both genders' body esteem. It was predicted that women's body esteem would be affected by media images of attractive, same-gender spokespeople, more so than men. However, it was found that both men and women's body esteem scores decreased significantly after viewing same-gender photographs. After viewing muscular, athletic images, men felt that their own image and lifestyle were inadequate to those seen on television. Men who compare themselves to these ideal images find it nearly impossible to live up to the bodybuilder-like physiques that are portrayed in the media. Just like women, men's self-esteem suffers as well.

Average-looking Spokespeople

Research on the effect of average-looking models on viewers' self-esteem is scarce. The question arises, do viewers still compare themselves to the average-looking spokespeople, and if so, what effect does it have on their self-esteem? If viewers compare themselves to the average-looking spokesperson, this may have an opposite effect on the viewer. In short, viewing advertisements with average-looking spokespersons may have a positive effect on self-esteem.

Views of the Self

Powell et al. (2001) suggests that people generally have positive biases about themselves. Self-enhancing illusions are self-serving biases, or unrealistically positive views of the self. These unrealistic views are mostly about people's talents, abilities, and

social skills. For example, most people that drive a car consider themselves to be above average drivers (Svenson, 1981, as quoted by Powell et al., 2001). These positive biases or self-enhancing illusions are suggested to have a function of improving mental health. However, people also seem to carry negative biases about the self known as body-image distortion. As discussed earlier, people tend distort their perceptions of themselves to feel unrealistically dissatisfied about their bodies. If it is true that body-image distortion is associated with negative aspects of mental health, then individuals should take the strategies associated with self-enhancing illusions and apply them (Powell et al. 2001).

One strategy is to select a group of people who are disadvantaged in comparison, so that in turn, the viewer will feel positive. This concept is called downward social comparison. This strategy could convince those with poor body-image that his or her body is more attractive than those of some others. As a result, "self-enhancement might occur if the comparison group was a disadvantaged group, such as obese people, or even if it were some abstract 'average' person" (Powell et al., 2001). By using both average and ideal advertising images and comparing them to how a consumer views oneself, one can see if self-esteem can be manipulated through the use of spokespeople. Also, it can determine if this strategy affects the memory for the product being sold.

Taking from the previously mentioned research, our research looked at the self-reference effect and how it can be seen in the viewing of average and ideal spokeperson advertisements. Further, we looked at how memory for the spokesperson, due to self-comparison, may lead to either negative or positive feelings towards the self. In forming our hypothesis, we used the results from previous studies, which showed that both men and women's body esteem scores decreased significantly after viewing ideal same-gender photographs. A study conducted suggested that the use of average spokespeople in advertisements might lead to a higher self-esteem or downward social comparison (Powell et al. 2001).

Purpose

The purpose of this study was to discover what viewers would remember from an advertisement; the spokesperson or the product. We also wanted to determine if the use of ideal images in advertising would lower the self-esteem of viewers to follow with past research. Finally, we wanted to find out if the use of average images in advertising had a positive or negative effect on self-esteem.

Those who view advertisements and compare themselves to the spokesperson will have a better memory for the spokesperson, not the product. If a person compares more when the spokesperson is attractive, he or she should remember more details about the spokespeople. Whereas if people view an average-looking spokesperson, they may have a better memory for the product. If viewing advertisements with attractive spokespeople has a negative impact on self-esteem then people who viewed the advertisements with attractive spokespeople should have lower self-esteem.

Methods

Overview. We adopted a procedure similar to that used by Henderson-King

(1997) to measure the effects of advertising images from magazines on memory for the product and spokesperson and self-esteem. We divided participants into three groups and were exposed to a compilation of advertisements combined in a Microsoft, Power Point, presentation. The average spokesperson group was divided into males and females and shown a selection of advertisements that contained five neutral products (i.e. deodorant, car, etc.) promoted by same-gender, average-looking spokespeople. The ideal spokesperson group was divided into males and females and shown a selection of advertisements that contained five neutral products (i.e. deodorant, car, etc.) promoted by same-gender, ideal-looking spokespeople (i.e. models, athletes, etc.). The control group that consisted of both males and females viewed five advertisements of neutral products (i.e. deodorant, car, etc.) without a spokesperson promoting the product. A pilot study was conducted to determine what was considered average and ideal-looking. After participants viewed the specific presentation, a questionnaire was administered. It regarded demographics, self-comparison of viewers' facial features and body image to average and ideal-looking people's facial features and body image, viewers' memory for the products and spokespersons, and self-esteem. We manipulated the ideal spokesperson group. In the consent form, we stated that participants would be tested on gender differences in memory of the magazine advertisements. We wanted to mask our intent to find the effects of advertising images on self-esteem as well as memory.

Participants. Participants were 23 male and 62 female undergraduate students enrolled in General Psychology courses. This study was conducted at the University of Wisconsin-Stout, a rural, midwestern school of approximately 8,000 undergraduate and graduate students in Menomonie, Wisconsin. Participants were randomly assigned to five different categories; female ideal spokespeople, female average spokespeople, male ideal spokespeople, male average spokespeople, and male and female non-spokespeople.

Materials and Instructions. We gathered 25 one-page, single spokesperson advertisements from past and recent issues of *Cosmopolitan, Glamour, Men's Health,* and *Sports Illustrated.* The basis for the ideal advertisements was taken from the study done by Franzoi and Shields, where they found that females pay attention to sexual attractiveness and body weight, and males pay attention to upper body strength (1984). We used full body images with a high level of attractiveness. They contained an emphasis of slender females and muscular males.

The basis for the average spokesperson advertisements were full body images, an average level of attractiveness, and an emphasis on normal/average figures. In each of these model types, we looked for products that were in full view, clearly represented, and a non-celebrity spokesperson promoting the product. In the advertisements with just the product alone, we looked for the products to be central to the advertisement with distinct features. After obtaining these advertisements, we scanned them into a computer and created five power point presentations to be automatically timed for thirty seconds per advertisement. After participants viewed the images in a dark room on an enlarged screen, they completed a questionnaire. There were five separate questionnaires, one for each of the categories.

The average spokesperson questionnaire for both genders consisted of demographic questions; a self-comparison of facial features and body image compared to ideal and average-looking people; ten short answer memory questions for each of the

advertisements; and a self-esteem test. For the advertisements that contained spokespeople, there were five questions about the spokesperson and five questions about the product. The ideal spokesperson questionnaire for both genders consisted of demographic questions; a self-comparison of facial features and body image compared to ideal and average-looking people; ten short answer memory questions for each of the advertisements; and a self-esteem test. For the advertisements that contained spokespeople, there were five questions about the spokesperson and five questions about the product. For the advertisements that contained products alone, there were five questions about the products.

Questions about the spokespeople pertained only to distinct features (i.e. hair color), facial expressions (i.e. smiling), body positions (i.e. standing), where they were located in the advertisement (i.e. center), where they were looking in relation to the camera (i.e. straight ahead) and specific clothing. Criteria for the questions about the product were color, slogans, brand names, packaging, and where it was located in the advertisement. All answers to the questions were clearly visible by viewing advertisement. The Rosenberg Self-Esteem Scale was located at the end of the questionairre (Rosenberg 1965). This was a 10-item Likert scale, with items answered on a 4-point scale-from strongly disagree to strongly agree. There were 40 points total. The higher one received on the questionairre, the higher the self-esteem one has.

Procedure. We gathered our participants by visiting General Psychology courses, and passed around five separate sheets to students with a specified time and location for each sheet. There was a sheet per condition for each gender. Some professors offered the incentive of extra credit or made it a class requirement. Each participant was given a reminder phone call on the night before his or her volunteered time.

On the day of the study, we waited in the room while the participants entered and took a seat. After they were each seated in clear view of the screen, we handed the participants the consent forms which they read to themselves. After they read it, we explained that they could leave if they wished and were free to do so without consequences. While one of us turned off the lights, the other started the power point presentation which showed each advertisement for thirty seconds. When the participants viewed the three-minute presentation, we gave each a questionnaire. When they were completed, they left it facedown on the table. When the entire group was finished, they handed their questionnaire to us and were individually debriefed.

Results

We obtained results by having an independent scorer grade the questionnaires by previously defined answers. Two memory scores were derived for each person, except for those in the non-spokesperson condition. First, a memory score was derived by totaling the number of points correct on the questions pertaining only to the product. Second, a memory score was derived by totaling the number of points correct on the questions pertaining only to the spokesperson. The maximum number of points for the spokesperson memory in all conditions was 50. The maximum number of points for the product memory in the male average condition and non-spokesperson condition was 50, in the male ideal condition the total was 58, in the female ideal condition the total was 52, and in the female average condition the total was 53.

After obtaining the scores for each participant we translated them into percentages. In order to test our hypotheses, we ran two, two factor mixed analysis of variance (ANOVA); one for males and one for females to detect the differences between the three different groups for each gender. The two factors were condition (average, ideal, non-spokesperson) and product/spokesperson memory.

Our prediction that participants who viewed advertisements with average-looking spokespeople would remember more about the product than the spokesperson was not supported by either males or females. Instead, females in the average condition showed a significantly, $F(1, 56) = 138.026$, $p = <.001$, better memory for the spokesperson ($M=.67$) than the product ($M=.44$). Males did have better memory for the product that spokesperson, but only slightly.

Our prediction that participants who viewed ideal spokespersons would remember more about the spokesperson than the product was supported. Males in the ideal condition had significantly, $F(1, 18) = 9.403$, $p = < .05$, better memory for the spokesperson ($M = .65$) than the product ($M = .44$). Females in the ideal condition had significantly, $F(1, 56) = 138.026$, $p = <.001$, better for the spokesperson ($M=.71$) than the product ($M=.56$). Overall, these analyses show that there was a main effect of the type of advertisement on the participants.

Finally, we turn to the prediction that participants who viewed average-looking spokespeople would have a higher self-esteem, and those who viewed ideal-looking spokespeople would have a lower self-esteem. The individual self-esteem scores were derived from the 10-question Rosenberg Self-Esteem Test with a 4-point Likert scale (40 being the highest score of self-esteem). After the individual self-esteem scores were derived, another two, two factor mixed analysis of variance (ANOVA) was conducted to evaluate the effect of type of spokesperson (average vs. ideal) between genders on self-esteem. There were no significant differences in self-esteem in either condition across gender.

Conclusions

In this study, we investigated advertising, and more specifically, what aspects of advertisements are retained in viewers' memory. We also looked at how different types of advertisements affect viewers' self-esteem (ideal images in advertisements have been shown to result in viewers experiencing negative feelings about themselves) (Richins 1991). Ultimately, we sought to find the relationship between comparison and memory, and comparison and self-esteem.

We found some very interesting information from this study. First, we discovered that females remember more about the average spokesperson than the product. We did not hypothesize this idea. These results could imply that females have a tendency to compare themselves to the spokespeople of advertising, whether the spokesperson is considered average or ideal. This could be a result of the repeated exposure to the preferred body image, causing females to not differentiate between average and ideal images. When a spokesperson is present, females tend to compare themselves and observe the image details, which is congruent with the self-reference effect.

Second, we found that the participants remember more about the ideal spokesperson than the product, as we hypothesized. We found that both males and

females remember significantly more about the spokesperson than the product. This is again congruent with the self-reference effect. Since both the males and females compared themselves to the spokesperson, they remembered less about the product. This could imply that having a spokesperson present in the advertisement may interfere with the memory for the product being sold. This presents the question as to what advertisers are really selling- the product or the spokesperson?

Finally, the participants' self-esteem who viewed ideal and average- looking spokespeople was not greatly affected. This could have several implications. One could be that certain participants have a high self-esteem and felt themselves to be just as or more attractive than the spokespeople they viewed. Also, brief exposure can not significantly alter self-esteem. Finally, the self-esteem measured used may not have been sensitive enough to measure differences in self-esteem.

Our findings are similar with past research. Spokespeople can inhibit viewer's memory for the product being sold due to the self-reference effect, with exception of males viewing average-looking spokespeople. As Conner, Grogan, and Williams (1996) and Jirousck (1996) found in addition to our discoveries, males are especially sensitive to ideal-looking spokespeople. What our study found different from the limited research on average-looking spokespeople is that memory for the product is again inhibited in females viewing these advertisements. Whether the spokesperson is average or ideal, females tend to compare themselves to the spokesperson. Females will pay more attention to the spokesperson and not the product. In the matter of self-esteem, our findings did not run congruent with the past research of Marsh Richins (1991) and Conner, Grogan, and Williams (1996). Surprisingly, it was shown in our study that brief exposure to the advertisements did not lower self-esteem of either females or males. Overall, past research of the self-reference effect was very evident in our study.

One limitation of this study was the small amount of participants in four of the five conditions. This resulted in the exclusion of the non-spokesperson condition when computing results. Therefore, we did not have a base measure of self-esteem to compare possible effects in average and ideal conditions. Future researchers may want to include a younger age group in the sample, such as teenagers. They're an important group due to the fact the make up a portion of the fashion magazine market. It might also be beneficial to administer higher sensitive self-esteem questionnaire prior to viewing the advertisements. Future research could take these limitations into consideration.

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Building Better Paper

Thad Fisher
Undergraduate Student, Packaging

Introduction

Paper is the oldest and most widely used form of packaging in existence today. Through the years, paper has continued to be the focus of many projects and has undergone numerous improvements. As engineers search for new ways to protect and contain products, paper continues to evolve and serve new purposes in the expanding world market. The issue is the lack of demand for ordinary paper results in the overproduction of paper. This has left many large paper mills wondering what went wrong. The global approach to paper production has shifted from high volume to high quality.

A study conducted by PricewaterhouseCoopers LLP shows the net earnings of the top 100 global forest and paper companies has dropped over 20 percent in 2002, while companies that focus on specialty grade papers have managed to improve their bottom line by 22 percent (Nelson 2003). Many paper producers and market analysts share PricewaterhouseCoopers'view of the paper industry. Simply stated, the market is flooded with standard paper. "The only way for some paper mills to stay competitive is to be innovative, produce new products, and break into new markets," (Harris, 2002). An article titled, "Packaging and Containers Industry" provided evidence that the market for craft and traditional papers is rapidly moving out of the U.S. and into other countries like China, Mexico, and India. This is happening for numerous reasons, including the fact that labor and supplies are cheaper and environmental laws are less restrictive in these countries (Harris, 2002).

Overview of Papermaking

The focus of this paper is to explore the production of higher grades of specialty paper through the use of pulp additives. In order to understand the advantages of pulp additives, one must first understand a little bit about the papermaking process. The main ingredient in paper is wood pulp. This is what provides the stability and volume needed to produce a sheet of paper. After this pulp is finely ground and mixed with water, it is beaten in pulping vats where other chemicals and materials are added in order to produce a sheet of paper with specific qualities. This is the stage when common additives such as starch (to improve tear strength) and polymers (to improve overall strength and decrease porosity) are added. Once the pulp and additives are beaten, they are carried to a head box. Next, a thin layer of liquid pulp is spread onto a moving screen. The screen then moves past stations where coatings can be applied to it. The coatings range from clay (to improve surface smoothness) to polyurethane (to decrease porosity). The screen then works with drying mechanisms, such as rollers and blowers, to remove excess water from the pulp, producing a dry sheet of paper. Every process up to this point is referred to as the wet end of papermaking.

After the paper has become a dry sheet, the properties of the paper itself cannot be changed. However, it can be coated or laminated with other materials, such as plastic or foil, in order to produce specific qualities that are often needed for packaging products. One example could include food packaging. Any lamination or addition of other materials to a finished sheet of paper is known as a dry end application.

Breaking into New Markets

Currently, packaging is exploding with new, innovative plastics and package manufacturing techniques. This allows for faster and easier packaging, shipping, storing and selling of products. However, through it all, paper has remained the most commonly used material for packaging and shipping. Why is this? It is because paper remains inexpensive and easy to produce in mass quantities. However, paper is being viewed as little more than a structural component in a package, serving only to contain the product and keep the package from collapsing. This means that in order to add barrier properties, greater tearing/bending strength, or enhanced printability to a paper package, it must be laminated with materials such as plastic or metal foil.

Imagine the never-ending uses that paper that could be considered for if the tear strength and barrier properties could be incorporated directly into the sheet. A number of companies are currently working to develop specialty papers with packaging in mind. These companies range from specialty chemical producers, to food packaging companies, to material engineering firms. Their main goal is to develop materials and chemicals that can be added to the wet end of the papermaking process to produce an enhanced sheet of paper with little additional investment of time.

In an article from BASF, the author discussed two new advances that this company has made toward increasing the tear strength of paper. The focus of the article was making a stronger paper bag, but the author admitted that he could imagine this technology being used in all types of paper production. They have succeeded in producing additives that can enhance the tear strength comparable to that of a plastic bag. The two advances were molecularly modified starch and a substance known as polyvinyl amine. As stated by the author, this technology can have great impacts in areas of packaging in which products must be contained by packages having high tear strength.

In this time of economic uncertainty, it has become increasingly important to capitalize on new and different areas of the market. As shown in Figure 1 below, consumption of certain types of paper has been unpredictable, showing a downward trend over the past few years. However, demand for specialty papers has continued to gain market share and outperform the rest of the industry.

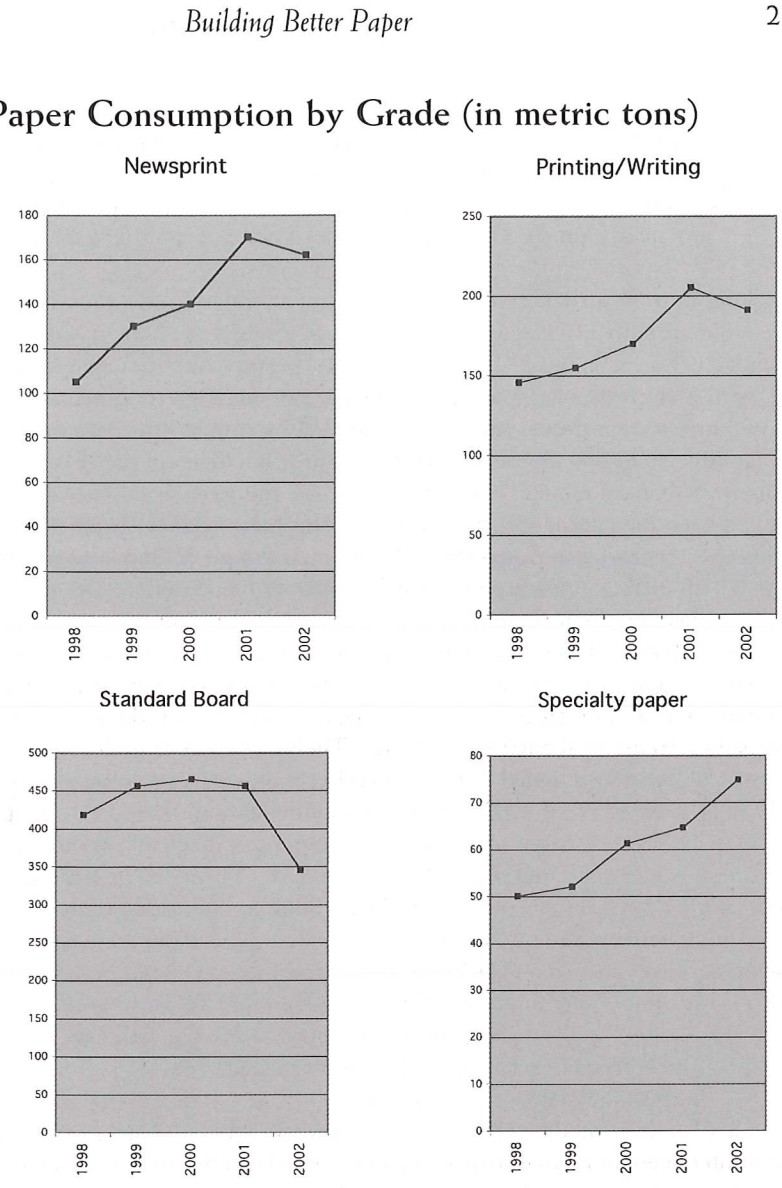

Figure 1: Paper Consumption by Grade (in metric tons)

Specialty / other grades refer to chemically or materially enhanced papers
Source PULPAPEL (1998-2002) Pulp and Paper Industry Report 2002

Material Savings

Material savings are an important part of improving any product line, in order to stay competitive. It is especially important in the paper industry because there are so few ways that paper can be improved. Basically, for the past few decades, paper has just been paper; nothing could be added or taken away from it. Now, additives have been devel-

oped that can drastically decrease the materials needed to produce a high performance sheet of paper. There are four main types of material savings related to the manufacturing of packaging paper.

1. Less Lamination

First, less lamination material is necessary when additives are added directly to the pulp (applied on the wet end of the papermaking process). In the past, 3M® used a technology called Scotch ban, a treatment added to the paper during sizing. This added treatment included the addition of a substance known as perfluorooctanyl sulfonate (PFOS). It has been shown to resist permeation by water vapor and grease, making it ideal for packaging foods and other products where permeation must be kept low. The paperboard produced with PFOS sizing has been used for various applications including fast food, ground coffee, chocolate, pet food, and hardware. It has even been used as an E-flute corrugated, for things such as pizza boxes. The benefit of this sizing agent is its virtual elimination of the need for laminates or dry end treatments (Keeping up Appearances, 1997). Although 3M no longer manufactures Scotch ban, other companies continue to produce PFOS and similar sizing agents.

2. Decreased Thickness

The second way to save materials is by simply decreasing the thickness of paperboard itself. When additives are used to create a stronger sheet of paper, this new blend of paper can withstand greater force per unit area. This makes a thinner sheet of paper just as effective as a thicker, untreated sheet. The same is true when examining the issue of porosity in paper. In the past, sheets of paper had to be made very thick because of paper's high porosity. Currently, additives and sizing treatments can be used to produce a sheet of paper that is much thinner, but capable of preventing the transmission of water vapor, even in extreme conditions. This effect is outlined in an article about polyurethane dispersion (PUD) (Osby, 2002). The article explains how the addition of polyurethane can turn ordinary paper into a high performance package by increasing its strength and decreasing its permeability at extreme temperatures (hot and cold). This is especially important for packages containing such things as hot coffee or ice cream because they are subjected to extreme conditions. PUD also maintains other important properties of packaging paper, such as printability.

3. Paper as a Barrier

The third way materials are saved is when paper acts as a barrier. Even if the paper still needs to be laminated, the barrier layers can be taken out. An example of the potential for material savings is a specialty paper called intergral. Intergral, developed by Elf Atochem, is a water and greaseproof type of paper designed for food packaging that is produced by mixing virgin wood fibers with Foraperle, a specialty chemical (Anon, 2002).

4. Printability

The final benefit of using additives to increase strength and decrease porosity is that the finished product is often better equipped for high clarity printing. It makes a lot of sense, enhancing the strength of paper allows it to run better in printing presses. Decreasing porosity allows it to receive and hold ink in a higher quality fashion. This is very important in the packaging industry because marketing is a huge part of selling any package. This technology could make it possible to print right on the package without

having to add any additional surface treatment or lamination.

Process Improvements / Time Savings

The best part of using additives on the wet end of production is that it often leads to great advancements on production lines. There are two reasons how the process can be greatly improved.

1. **Ease of Use**

First, increasing additives directly in your pulp requires little additional time. Even the machinery needed for sizing treatments can be added right into your existing packaging line. There are a number of companies that specialize in the production of chemicals and pulp additives. Additives are developed with specific uses in mind and the companies that produce them have a great technical understanding of their effects.

2. **Less Machinery and Lowered Operating Cost**

The second way to make improvements involves a big time saver in the packaging industry. Wet end additives can eliminate the need for lamination or dry end treatments. Currently, a sheet of paper that has already been produced and stored must be reloaded onto a second machinery line, where it is laminated with many additional materials. In the future it is conceivable that the need for lamination may be totally eliminated. At the very least we can expect that some of these laminating steps can be cut out of the process. This will undoubtedly lead to the simplification of the laminating process, less need for additional workers, the elimination of some machinery, and an overall process improvement. This results in lowered operating costs.

Environmental Issues

When making changes to the structure of paper, environmental and recycling issues must also be explored. There are a number of factors to be considered, depending on circumstances surrounding the production, application, and end use of the paper.

1. **Increased Recycling Due to Less Lamination**

In the case of packaging paper, there appears to be potential for more environmentally friendly materials. Although the paper itself may be impregnated with certain additives, this does not necessarily mean that it will be less recyclable. In fact, the use of additives may make paper more recyclable. It will replace paper that had previously been laminated or coated with some other material through the use of an adhesive. In recent times, it has been adhesives and laminates that have been the primary barriers that prevent effective recycling. In Europe, legislation passed in order to avoid making paper recycling and recovery of cellulose fibers more difficult. It is necessary that all substances and procedures that contact paper during its service life not interfere with recycling (Onusseit, 2000). This is important because most laminates and adhesives are considered to be detrimental to the recycling process. Most pulp additives and wet end treatments do not significantly affect paper's recyclability. In the near future it is likely that similar legislation will take place in the United States, and much like laws in Europe, there will be certain exceptions and percentages that paper manufacturers must not exceed.

2. **Using Less Landfill Space**

The type of paper used to package foods and other materials may make it more

difficult to recycle, reducing the probability that the end user will bother recycling it. This means that these food packages often end up in landfills. In this case, it is advantageous to decrease the volume of the packaging material as much as possible. This can often be accomplished by using a thinner, but higher quality paper produced by using wet end additives. Basically, thinner material and less laminates means that paper produced with additives will contribute less to landfills. It may also be recycled more easily because it is not laminated with other materials.

3. Point Source Pollution Reduction

One final advantage that may be overlooked is quite simple. Paper mills may reduce the amount of waste produced while manufacturing the paper. It is well known that paper mills are a major contributor to air and water pollution. Although legislation and environmentally concerned paper producers have greatly decreased pollution levels, there is still a substantial amount of pollution still being produced. If paper mills were to change their product lines to include the production of higher quality papers, they would be able to sustain their profits by producing less paper. Paper mills could focus more on quality and less on volume, thus reducing pollution.

Conclusion

It is important for today's companies, small and large, to remain innovative and competitive in the market. In the case of paper mills, soon there will be a wide spread revolution brought about by the poor economy, stiff foreign industry competition, and the rapid growth of technology.

Paper mills need to look into using wet end additives for a number of reasons. Simply stated, the most important reason is that stronger, higher quality paper is more valuable. A paper mill can expect to increase profits while shipping and producing the same amount of paper. This also means an increase in demand. Package producers will realize that it's more economical to use specialty paper than to laminate and treat paper in-house.

The transition itself is not a complicated procedure. In fact, paper mills can use their existing machinery to produce paper with additives, and the companies who produce these additives can provide their expertise.

Packaging engineers can have a great impact on the production and profitability of their companies simply by understanding the benefits of wet end additives. Furthermore, knowledge of this ever-changing technology could realistically justify the position of any packaging engineer within company ranks.

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A Family Impact Analysis of Covenant Marriage in Minnesota

Holly Miller
Undergraduate Student, Human Development and Family Studies

Introduction

Family impact analysis is both a research method and a mindset. Families are a vital part of our society and are very important to most Americans. The family provides basic care, education, and socialization to its members. Traditionally, policymakers have developed policy that is focused on an individual in the family (i.e. elderly, children, disabled, worker, etc). When focusing on individuals, policy ignores the effect on the family as a whole. In recent years, policymakers have worked to examine the impact that policy will have on the family system rather than just the individual (Bogenschneider, 1993).

Family impact analysis is a research method that looks to examine the consequences of a policy, both intended and unintended, on families. This is done by using six guiding principles to assess and describe the impact that a policy will have on families (Bogenschneider, 1993 and Shonyo, 2002).

Society has long been interested in the institution of marriage. For many people, it is considered a rite of passage to adulthood and the start of a family. Over the years, the lines that define what a family is have blurred and perceptions have changed. Who is considered a family member? People have many different opinions about what actually determines this. Studies have shown that marriage has remained quite popular. In fact, it is estimated that 85 to 90 percent of young people today will eventually marry (Hawkins, Nock, Wilson, Sanchez, and Wright, 2002). The popularity of marriage is quite often compared to the divorce rate. The U.S. divorce rate has risen since the 1920's, which spiked after World War II. After dropping, it rose again in the 1970's. The U.S. divorce rate peaked at 5.3 per 1,000 in 1981, before slightly declining (McGeveran, et al., 2003).

The most recent dramatic rise in the divorce rate (1970 to 1980) coincided with a change in divorce law, namely, the no-fault divorce. In 1970, California was the first state to offer no-fault divorce and since then, every state has followed suit (Hawkins, 2002). The debate about divorce law and concern about the rising divorce rates has caused states to look at laws concerning both marriage and divorce once again. One response to this has been covenant marriage, an alternative to the traditional marriage license. Currently, Louisiana, Arizona, and Arkansas have covenant marriage laws (Perina, 2002). Since Louisiana passed the first covenant marriage legislation in 1997, 19 other states have considered such legislation, one of them being Minnesota (Nock, Wright, Sanchez, 1999). In this report, I will discuss the details, rationale, and results of covenant marriage, using the principles of family impact analysis.

Literature Review

Many wonder, why covenant marriage and why now? Scholars have spent

years studying marital patterns, and in the 30 years since no-fault divorce was born, there has been a lot of discussion about this institution.

There are many facets that can affect the quality and the quantity of marriages. Over the past 20 years, people have been waiting longer to marry and to have children. There has also been an increase in premarital cohabitation. Research has shown that individuals who cohabitate prior to marriage tend to see higher rates of divorce. People have had more of a tendency to marry into heterogamous relationships. Differences among people can lead to more conflict. These changes, along with the woman's increased involvement in the workplace, have been associated with perceived declines in marital quality. There is also a common belief that marriage is in decline. People are moving away from marriage due to certain difficulties of maintaining a successful relationship (Amato, 2003).

Divorce is necessary in some cases. There are marriages that simply need to be dissolved. Even though that is the case, divorce still has significant harmful effects on those involved. Children of divorced parents fare the worst. Studies have shown these children have increased academic and social skill struggles. They are also known for having a higher rate of divorce in their own marriages. Divorced women with children, in some cases, have financial difficulties and have trouble making ends meet. It has been shown that they are more likely to live in poverty after a divorce. Some scholars suggest that the education and counseling components of covenant marriage would be beneficial in preventing these effects. If the individuals discover issues that may cause marital strife, they can deal with them before they get out of hand and possibly before children are involved. "The precommitment made in Louisiana covenant marriage would lead to, like other bonding devices, to better later choices" (Brinig, 1998).

There has been concern over the years that no-fault divorce makes divorce too easy. It was designed to allow people to get out of bad marriages easily. Some people feel it is the easy way out of any marriage. No-fault divorce gives no leverage to the person being divorced. He/she cannot change or stop the process. Covenant marriage gives more power to that person. Katherine Spaht, a legal professor (who will be discussed later), states, "What we have now amounts to legalized abandonment. This law says, 'You leave me, I set the terms'" (Carey, 1999). There has also been concern that marital therapy is ineffective. Research into marital relations has given therapists a better knowledge base to work from. Now therapists understand that there will always be differences between couples. Therapists are focusing on teaching couples the relationship skills they need to deal with these differences to avoid divorce-inducing conflict.

In recent years, a marriage movement has evolved. People have been pushing for the government to recognize that marriages must be strengthened, and they have been working to do it. Clergy have worked to develop premarital counseling and couple mentoring. Katherine Spaht, as mentioned earlier, helped write Louisiana's no-fault divorce bill in the 1980's. Since that time, she has seen divorce devastate the lives of many women. Spaht then helped Louisiana draft their covenant marriage bill that passed in 1997. This gave more legal clout to the individual who did not want a divorce, making the marriage license more legally binding (Gallagher, 1999).

After a push towards premarital education, improved marital counseling and concern about the high divorce rate, Louisiana passed their first covenant marriage law

in 1997. The law allowed for divorce in cases of adultery, felony conviction, abuse, or abandonment. In the case of a couple who simply does not want to be married any longer, couples are required to live separately for two years before a divorce will be granted. However, since this law requires couples to receive premarital education and counseling during marriage distress, the hopes for lifelong marriage is high.

There has been support for covenant marriage. Many found this interesting because it appears to limit an individual's options and freedoms. The positive feedback comes from the fact that states do not criticize no-fault marriage. They focus on the strengths of marriage instead. This strength-based approach makes for a positive look at the situation. There is also the terminology to consider. The word *covenant* is full of religious meaning. Some find this a concern due to the separation of church and state laws. It is important to look at the words; this marriage is, in a way, like a contract. A contract implies the giving and receiving of service. One person gives service to another for some form of payment (i.e. a carpenter). A covenant marriage can be seen as an agreement between two parties, each giving and receiving an equal amount (Gallagher, 1997).

The Louisiana law has had its critics. Feminists have brought up concerns that women will move backwards and will be trapped in bad marriages. Conservatives are concerned that the government is being too intrusive. There has also been concern that not enough couples will choose the covenant marriage option to make a significant impact on the divorce rate. What is so interesting about Louisiana's law is, that it passed. We are in a society that values freedom, moving on, and ever changing relationships. Louisiana's law may not drastically change the divorce rate, but it sets a standard that marriage should not be entered without much consideration (Loconte, 1998).

After Louisiana passed its covenant marriage law, many states quickly reviewed the possibility of this law. Arizona passed a covenant marriage law soon after Louisiana. The laws were nearly identical with one important difference. Arizona allowed for substance abuse and/or intemperance as additional grounds for divorce (Arizona Revised Statutes, 2003). This is important because it recognized the dramatic effects substance abuse has on a family. Besides the substance clause, Arizona's legislation is almost identical to Louisiana's.

Steven Nock, Ph.D., is a professor of sociology at the University of Virginia. He has been conducting a five-year study of 600 couples. Half of the couples are bound by covenant marriage. So far, he has found that most covenant couples tend to be religious and conservative. The difference between those couples and the couples seeking a regular marriage license is "a certainty that this relationship is the right one" (Perina, 2002).

Covenant marriage laws have changed the system in a unique way. In states where covenant marriage laws exist, the couples must choose which license they want. Even if they do not choose to have a covenant marriage, they are still required to choose. This will spark discussion, which is the intention of the law. It will force couples to seriously look at their relationship before actually marrying. There has been concern over covenant marriage. Many wonder, is this the beginning of a slippery slope? Some individuals are concerned that the development of different types of marriages will lead to others, such as gay and lesbian marriages. Another concern many

have is government getting too involved with marriage. However, Steven Nock found the same people that objected to government "invasion" with marriage had no problem with the state's involvement with the consequences of divorce. Yet another concern with covenant marriage legislation (as written) is there are no standards for counseling or the licensing of counselors. While counseling is required, there are only vague and minimal requirements about what should be covered. There is nothing to prevent bad counseling. A couple could see three different counselors and hear different advice from each one.

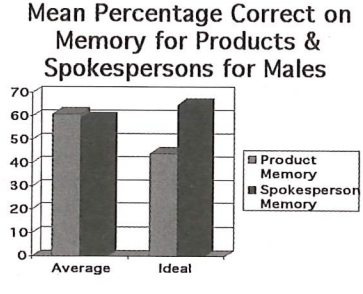
Throughout the three states studied, Hawkins et al., found there are mixed feelings. He discovered that the majority of people felt positive about some components of covenant marriage (the education and counseling) and questioned others (the waiting periods). They tended to be lukewarm about the policy as a package. Hawkins found that individuals who seek covenant marriage tend to hold conservative, traditional ideologies and are religiously active. Also, the political and social climate may be accepting of some of these changes.

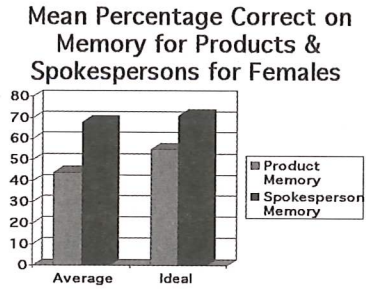
Interestingly enough, another study was done with forty-two women in eight focus groups. They discussed covenant marriage as a policy in Minnesota. As they gained more information on the policy, many of the women came to view it in a negative fashion. This was very different from the findings in Hawkins' research. The author, Julie Kohler, stated that this demonstrates the differences in research methods (phone survey vs. focus group) rather than discounting the previous studies. Regardless, it shows that more in-depth research should be done to accurately assess the policy and public opinion of it.

Description of Policy

During the 81st legislative session (1999-2000), a bill was introduced into the Minnesota State Legislature providing for the option of covenant marriages. H.F. No. 1571 is the version of that bill that went through the House of Representatives. The bill was similar to legislation that was passed in Louisiana and Arizona legislature.

A covenant marriage is an alternative marriage license. Couples who choose to have a covenant marriage are required to participate in twelve hours of premarital education (by a licensed minister or a practitioner of Marriage and Family Therapy) covering several items. This would include a premarital inventory, conflict management techniques, the teaching of communication skills, and the obligation to seek out marital





therapy during times of serious marital difficulty. The education was also to discuss the seriousness of marriage and the fact that it is a life long commitment. Couples choosing a covenant marriage voluntarily give up their right to a no-fault divorce. The existence of a covenant marriage only affects entering the marriage and the grounds for seeking the dissolution of the marriage; it does not prohibit either party from seeking protective orders, a legal separation, child support, custody, visitation, or property division. The dissolution of a covenant marriage will only be granted if proof of one or more of the following conditions is presented:

1. One of the spouses committed adultery.
2. One of the spouses has been convicted of a felony and has been sentenced to imprisonment.
3. One of the spouses has abandoned the home for one year and refuses to return.
4. One of the spouses has physically or sexually abused the spouse seeking the dissolution of the marriage or a child of one of the spouses.
5. The spouses have been living separate and apart for two years without reconciliation. Couples are considered living separate and apart even if there have been brief interruptions of the separation to pursue recon ciliation, to fulfill mutual obligations and responsibilities, or sharing living space for economic reasons but are sleeping in separate rooms.

Couples seeking dissolution under clause five are also required to complete twelve hours of marital therapy aimed at reconciliation. Couples seeking dissolution under clauses one through four are not required to seek such therapy.

Couples are informed about covenant marriage in a pamphlet received at the time they apply for their marriage license. Their clergy or the judge, whomever they choose while making arrangements for their wedding, may also inform them of the option.

Family Impact Analysis

As a policy, covenant marriage is explicitly aimed at newly forming families. However, it does allow for couples that are already married to switch to a covenant marriage. The policy increases the competencies and relationship skills of the marrying parties through education and counseling. Covenant marriage implicitly teaches social responsibility by allowing circumstances of certain behaviors (i.e. felonies, adultery) to be grounds for immediate divorce. It implies that these behaviors are inappropriate and unacceptable. It also makes couples take marriage seriously by requiring premarital education and counseling during times of duress.

Marriage and divorce laws are mandated by the individual states. Therefore, covenant marriage is a state level policy. Thus far, Louisiana and Arizona have passed nearly identical legislation while Arkansas has passed a similar bill. Though considered in 19 other states, including Minnesota, no other states have passed covenant marriage legislation (Nock, et al., 1999). As mentioned earlier, the six principles of covenant marriage will be discussed.

Principle One: Family Stability

The explicit, primary focus of covenant marriage is to strengthen marital commitment. It requires couples to explore their relationship and potential marriage before they actually marry. Couples entering into a covenant marriage voluntarily give up their right to a no-fault divorce. Before marriage, couples that choose a covenant marriage must fulfill the required amount of premarital education. During times of deep marital stress, the policy states that parties have the ethical responsibility to receive counseling. Couples seeking a divorce under clause five must receive twelve hours of counseling and wait two years without reconciliation before being granted a divorce. Otherwise, the couple can only divorce under very strict conditions. It is not easy to enter or exit a covenant marriage. Lawmakers want to stress that marriage is a lifelong commitment and not one to be entered into lightly. This policy attempts to prepare the couple for marriage and prevent problems before they begin.

Principle Two: Family Support and Responsibilities

Policy should enhance the family's ability to take care of themselves and resolve their problems. Covenant marriage does this by providing education on relationship skills and conflict management before the marriage begins. It also requires the couples to seek out counseling during times of trouble. This erases the debate of "should we get help for our marriage?" The premarital education and counseling can also build a support network for the new couple so they feel they have a place to turn.

Principle Three: Family Involvement and Interdependence

Through counseling and education, covenant marriage teaches the couple conflict management and communication techniques. Teaching these basic relationship skills will allow the parties to identify their individual needs, their partner's needs, and the needs of the family. There is an understanding that marriage is a partnership, a contract, between two individuals. It also recognizes that there are some marriages that need to be dissolved without delay. This may be in the best interest of one of the individuals.

Principle Four: Family Partnership and Empowerment

The written materials provided by the policy treat the parties as partners in the service. They were published to teach the skills needed to have a more successful relationship. Covenant marriage is a broadening of the choices available to couples planning a marriage. It is an option that includes education and skill training. This will assist the parties in fulfilling their familial responsibilities. Program professionals are resource providers and can be mediators. Their primary role is to help the couple enhance their own relationship skills and conflict management techniques. Program professionals may also help the couple locate areas that may cause problems and have discussion before the problems actually arise.

Principle Five: Family Diversity

Covenant marriage explicitly states that the preferred family structure is a married man and woman. It is aimed at families in the newly forming stage of the family

life cycle. That being said, it is possible for couples that are already married to switch their marriage to a covenant marriage. In the case of covenant marriage, normal family functioning is considered to be choosing one's spouse carefully and remaining with that spouse for a lifetime. It is also expected that couples are continuously working on their relationship and they will dedicate time and resources to maintaining the relationship and the family ties.

Principle Six: Targeting Vulnerable Family

This policy is not specifically targeted at vulnerable families. It is offered to all families and it is their choice to participate. This policy is aimed at preventing problems before they begin by providing premarital education. This education can help to identify problem areas before they arise. There are no sliding fee scales, but it is possible for families to receive lower cost education and counseling through their minister if that is part of their lifestyle.

Conclusion

Marriage has always been an institution in our society. In the majority of cases, it is indeed the beginning of a family. Maintaining this institution is a laudable goal, particularly when the implicit goal is to strengthen families through marital and parental commitment. Covenant marriage is an attempt at doing this. I have some concerns regarding the policy as written. It is my opinion that adultery should not be grounds for an immediate divorce. I do not think that it falls in the same lines of a felony conviction or abuse. It seems to imply more of a moral judgment than a breaking of any law. I believe that requiring counseling would be a more appropriate response. It is possible for couples to recover from such an event. I also found it curious that there is no specific mention of substance abuse in the Minnesota bill. I think this is a discrepancy. Substance abuse can put the spouse and dependents in jeopardy in many different ways. I also wonder how and if low-income families could afford the education and counseling component. If, during the marriage, they cannot afford it, would the state step in and assist, as they are the ones requiring it? I also wonder about moving to a different state. What happens to the covenant if the couple moves across state lines? What if one of them moves and the other stays? And is this a step back to no-fault divorce? What effect would this have on women? These are questions that would need further consideration.

There are many problems in our society today. We are currently in a health care crisis. We have millions of people who are living in poverty. Many states are looking down the barrel of a budget shortfall. Our military is currently activated in Iraq. Strengthening families is very important, which I feel is a vital step in being a successful country. Covenant marriage will not be the only solution, if it is part of the solution at all. The solution has to come from a multi-disciplinary approach that works on all sides, not just the marriage angle. Families come in many forms and marriage is not always a part of them.

Marriage is a good thing and should be encouraged. It is good for most adults, children and families. Covenant marriage could be particularly effective with the education and counseling components. These components should be encouraged and studies

should be done on the possibility of incorporating these components into current marriage and divorce law. Covenant marriage is also a choice. This is a good thing in a country that places high value on its choices and freedoms. From the majority of study findings, those who choose covenant marriage are likely to stay together a lifetime. They place a high value on commitment and take marriage quite seriously.

What is most important about covenant marriage is the recognition that a value needs to be placed on family formation. Lawmakers are recognizing that couples need to be better prepared for marriage to be successful at it. Even though the legislation did not pass in Minnesota, by introducing the bill, the legislature is recognizing the importance of the issue.

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E-Beam Sterilizes the Industry

Chris Boyd
Undergraduate Student, Packaging

Introduction

When an engineer packages for medical industries, there are many issues to put into prospective. The first issue that comes into most people's minds is sterilization. In many recent cases, medical devices have not been properly sterilized, which has lead to the death and illness of many patients. This, in turn, could possibly result in lawsuits. There are many ways that medical device manufacturers sterilize their packages and products.

Although great amounts of package testing are done after the sterilization process, problems still arise when the product hits the market. All sterilization processes have their own adverse effects. One main issue that arises frequently is the seal integrity on medical packaging pouches. A two-polymer bond, or a polymer and Tyvek, bond create the seal. Sometimes these bonds are weakened or broken down by the most commonly used sterilization method today, ethylene oxide. This leads to an open environment and entrance for microorganisms and bacteria. Other aspects such as breakdown in strength of packaging components and aesthetic appeal also occur through many other processes.

These major concerns have prompted companies to look into electronic-beam sterilization, more commonly known as e-beam. Positive issues such as cost/time, atmospheric effects, and material effects to packaging will result in a change.

E-beam sterilization is a rapid-growing process being used in the medical industries. New technology and the ability to control the energy level within the beam are reasons the process is being used more often. The first work with ionizing irradiation took place in 1895; the process was patented in 1921. In 1965, the Surgeon General stated the e-beam process was safe to use on medical device packaging. Since then, the process has increased in popularity. Now, we have materials compatible with e-beam technology. Other uses for e-beam have also become popular, such as strengthening certain materials, irradiating mail, and most importantly, keeping medical products safe. E-beam is being used more often today because the technology is advancing rapidly.

The Electron-Beam Linear Accelerator, (E-beam) works similar to a television tube. Instead of electrons being widely dispersed and hitting a phosphorescent screen at low energy levels, they are concentrated and accelerated close to the speed of light. This produces very quick reactions on molecules within the product. A conveyer or cart system moves the product to be sterilized under the e-beam at a predetermined speed to obtain the desired electron dosage. Products move in and out of the irradiation area continuously. Product thickness depends on density and electron energy.

Sterilization Methods

There are many different processes used for sterilization. Methods such as e-beam, gamma, and ethylene oxide (ETO) are most common. While e-beam and gamma are very similar, ETO is a drastically different process.

ETO sterilization is completed while packaging is in its final configuration. The process ends by placing the packaging and the product into a large chamber. Gas is pumped into the chamber and then vacuumed out continuously for up to 14 days.

Time Advantage

Time can be a major issue when it comes to sterilization processes, especially when a customer needs the product immediately. The three main types of sterilization used on medical packaging vary in time. According to a Steris, contract sterilizer, ETO sterilization can take up to 14 days on certain cycles. (Steris Representative, 2003). Many major medical companies are now contracting the ETO process to an outsource company, such as Steris or Cosmed,. As one can see this would be very time consuming. The company must first send the packaged product to the sterilizer by truck or air before the process can start. The next reason is that this process requires time for the ethylene oxide to permeate through the package and chamber size is limited. Most ETO chambers can hold between 6 and 10 pallets of product. If the company has more product than this, the process will not begin on the next four to six pallets until the first batch is done. Once this is completed, the pallet must then be loaded onto a truck and shipped back to the medical company, or to its distribution center.

With e-beam sterilization, time issues can easily be eliminated. They can be decreased to a point that is not even comparable to ETO. E-beam sterilization can be fast enough to implement at the end of the production packaging line. With this advantage, no other form of sterilization can match e-beam. At most, e-beam would take one minute per package. This time would be far less than any other process. Gamma irradiation can take 4 to 6 hours, while ETO can take up to 14 days.

Cost

Cost issues also give e-beam the advantage over other processes. As described in the above section, e-beam is a major time saver, and time is money. E-beam also can be added into the production line, which cuts down the distribution costs, amount of handling, and its inherent risk. According to a Titan representative, the initial cost to implement the system into the line is minimal compared to the cost of having contract sterilizer bills and added distribution costs (Titan scan rep, 2003).

There is also a cost savings over the ETO process due to the elimination of an expensive packaging component. With e-beam, there is no need for Tyvek or any other type of porous material on the sterile barrier. The need for porous materials is eliminated (Allen, 1998).

Effects of Processes

As previously discussed, all forms of sterilization have negative effects to a wide variety of packaging materials. These effects can vary from material to material and between the different packaging components. Sterilization can affect polymers, seal

strength, label and box adhesion, corrugated and paperboard strength, and material color. E-beam and ETO do have some similar effects, but ETO has more adverse effects in the long run.

The major issue with ETO has to do with medical pouches. Both polyethylene-polyethylene bags and polyethylene-Tyvek bags can be affected. Major pressure changes within the sterilization chambers. During the ETO process, gas is flushed throughout the chamber and enters the packaging through a Tyvek portion. For this process to work, the packaging must have a porous material so the gas can get through the packaging and onto the product. The gas, accompanied by heat, enters the chamber several times. Every time the gas enters the chamber it must also leave. These chambers have vacuums that suck the gas out of the chamber, and also out of the packaging. This pressure change can drastically reduce seal strength and in some cases burst the pouch, resulting in catastrophic consequences. If the seal strength is weakened, or the bag bursts, the sterile environment is lost and the product could be exposed to bacteria. These bacteria could often lead to problems mentioned earlier.

Another downfall to ETO sterilization is the effects heat can induce on packaging materials. This heat can exceed 150 degrees F. Many polymers tend to distort or melt at these extreme temperatures (Device Link, 1997). The heat within these chambers can fluctuate 15 degrees above or below the intended temperature. This heat can also reduce the strength of polyethylene-Tyvek seals by greater than 55 percent. In turn, this decrease in strength can lead to a non-sterile environment and negative effects.

Another negative effect that ETO has on packaging is the decrease in strength of corrugated and paperboard materials. This decrease in strength can lead to distribution and handling problems during post-sterilization. Why do these materials get affected? This decrease in strength does not occur during the actual process, it occurs when the product leaves the sterilization chambers. After having been in extreme heat for up to 14 days on and off, the product and packaging absorb a great amount of heat (as discussed in the previous paragraph). After the process, the product is immediately removed and put on the shipping docks to be distributed to the customers. This is an uncontrolled environmental situation. When this product gets moved into the distribution cycle, there is a high risk of damage.

Effects of Irradiation

Radiation can cause the breakdown of packaging materials at high energy levels, but the level to decontaminate a product through medical packaging is low. The problem with this breakdown is the creation of free radicals from polymers. This can lead to the material becoming part of the product. The creation of free radicals is known as chain scissioning (RDI Services, 2003).

Chain scissioning occurs when a substance/polymer is exposed to an excess of radiation. The carbon-carbon bonds that connect atoms can become detached and possibly destroyed. This problem can lead to decreased tensile strength within a polymer. This problem can easily be avoided as new polymers are being created that have longer chains and will not detach. Such polymers as EVOH are unaffected. EVOH contains five chains, and e-beam has only slight breakdown of one of these chains (Greenburg,

2000).

On the opposite side of the spectrum, e-beam can be advantageous to use with some polymers. A phenomenon called cross-linking can take place within certain packaging polymers used in the medical field. Cross-linking occurs when the beam hits the material and allows the molecules to slip and slide over each other. The molecules intertwine and create many benefits. Some of the benefits include increased tensile strength, increased form stability, resistance to deformation, resistance to solvents, shrink memory, and the resistance to stress cracking.

Polyethylene is one polymer that can benefit from e-beam sterilization. Certain studies have been done to even benefit non-packaging materials (RDI services, 2003).

Although there are a few exceptions, most polyolefin materials will cross-link. With some simple engineering in materials, packaging configurations can benefit from the e-beam sterilization method. E-beam is the only process that will benefit certain polymers, and shows little effects to fibrous materials, such as corrugated and paperboard.

Atmosphere

The next point is the effect on the atmosphere around the sterilization process. This also seems to be an area where all processes have their downfalls. E-beam again leads in this area with the minimal amount of effects.

E-beam only creates one problem for the atmosphere. During the process, small amounts of ozone are released and exhausted into the air, however, this is the only effect to the environment. The possibility of a person coming in contact with the beam is the only other problem, and workers in the area must where protective vests.

ETO has major issues and atmospheric effects. ETO gas is considered highly flammable, a toxin, reactive, and a carcinogen. Long time users that have come into contact with the gas may have neurological and respiratory damage (No Harm Org, 2003).

Conclusion

There are wide arrays of disadvantages to packaging sterilization processes. Sterilization methods are very important priorities when engineering medical device packaging. One must take this into consideration as lives could depend on package design. The advantages of material issues, time and cost savings, and the effects on the atmosphere it is clear to say that e-beam has a bright future. More and more companies are converting to e-beam sterilization as the material compatibilities are increasing at an incredible rate to suit the needs of the method. E-beam can save lives, money, and time for the packaging of medical devices.

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Retracting from Traditional Needles

Travis J. Mueller
Undergraduate Student, Packaging

Introduction

As estimated by Modern Healthcare, "As many as 600,000 times each year, healthcare workers across the country risk infection when needles, scalpels, or other sharp instruments break their skin" (Becker, 2000). Of these estimated 600,000 annual accidental needle sticks, as many as 39 workers are infected with HIV. Another 4,400 contract one of several forms of hepatitis, according to the International Health Care Worker Safety Center at the University of Virginia (Hensley, 1999). It is also estimated by The Service Employees International Union (SEIU) Nurse Alliance that enforcing the use of safety syringe devices would prevent more than 80 percent of the needle-stick injuries (Safer Needles, 2003).

Why should programs be enforced to implement retractable style safety syringes in medical environments? With all the new laws and regulations that are being enforced, fines can be issued to practices for non-compliance towards implementing programs that enforce the use of safer needle devices. After considering the advantages that retractable syringes have to offer, it is a wonder to why no more than 20 states, as of December 18, 2002 have followed the success that California started back in 1998 when they pasted legislation calling for safer devices (Legislative Update). This document mentions why it is important that the rest of the U.S., as well as other countries, follow suit and begin their own safety syringe programs.

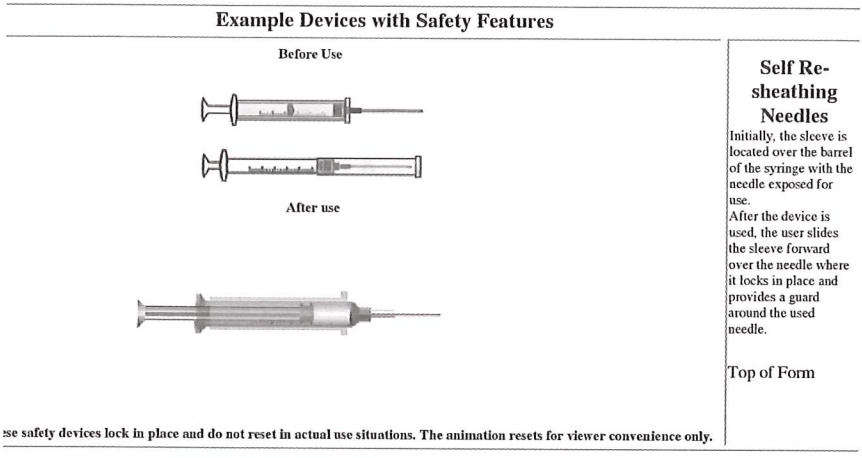
Retractable Syringe and How it Works

A retractable or safety syringe acts in the same manner as a traditional syringe. However, after the complete amount of fluid has been injected into a patient, the needle of the syringe quickly retracts protecting the user form accidental needle sticks. When drawing blood, there is also a safety syringe that enacts a safety barrel over the exposed needle, protecting the user from harm once again.

Features of Self Re-Sheathing Needles

The basic principle of the self re-sheathing needle is as follows; the needle is removed from the patient and a barrel around the outside of the main casing slides forward and protects the exposed needle. After the barrel is in the forward position, it is locked in place providing a guard around the used needle. The barrel is moved by an internal spring that is released when the syringe is fully depressed, or all of the fluid is drained from the reservoir.

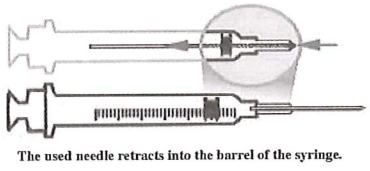
Figure 1: Self Re-sheathing Needles



Features of Syringe with Retractable Needles

A syringe with a retractable needle works similar to a self re-sheathing needle. The main advantage is that the needle fully retracts into the body of the syringe, thus saving space for disposal and eliminating parts. After the needle is fully depressed and all fluid is injected into the patient, a spring or gas cell enacts the needle and retracts it fully into the body of the barrel where it is locked in place. The only variation in the design is whether or not a spring or a gas cell is used. Both perform the same task, however LOM, the producer of gas cell syringes claims, that their product retracts in a more controlled measured manner, producing less tissue tear and blood spatter (Berg, 2002).

Figure 2: Syringe with Retractable Needles



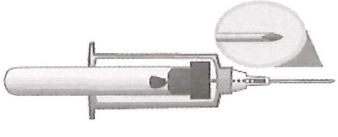
The used needle retracts into the barrel of the syringe.

Syringe with Retractable Needles
After the needle is used, an extra push on the plunger retracts the needle into the syringe, removing the hazard of needle exposure.

Top of Form

Features of Blunt-Tipped Blood Drawing Needle

The blunt-tipped blood-drawing needle is used in place of traditional syringes. The device works similar to conventional needles, until the correct or full amount of blood is drawn from a patient. Then the user must push the tube forward to cause a barrel to depress around the outside of the exposed needle. This process can be done before a complete draw or is automatically done as part of the motion when tube becomes full.



Blood collection tube and blood drawing syringe.

Blunt-Tipped Blood Drawing Needle
After blood is drawn, a push on the collection tube moves the blunt tip needle forward through the needle and past the sharp needle point. The blunt point tip of this needle can be activated before it is removed from the vein or artery.

Top of Form

(All illustrations provided by NeedleSticks / Sharps Injuries, 2003)

Protecting Users

As previously stated, it is estimated that 600,000 healthcare workers are injured each year due to accidental needle sticks. Because so many cases remain unreported, this number has been estimated as low as 384,000 cases, and as high as one million annually. The Centers for Disease Control and Prevention (CDC) estimates that 57 percent of needle sticks go unreported (Smart, 2000). With so many accidents happening to nurses, doctors, and phlebotomists (specialists who draw blood), it is important that safety needles become more common and eventually replace traditional syringes.

Accidental Needle Sticks Do Happen

Accidental needle sticks can happen when one least expects it. In 1997, Lisa Black was accidentally stuck by a needle when a startled patient jerked his arm away during a routine injection. Although the odds of this patient carrying a blood disease were low, Black still underwent monthly tests and an emergency regimen of AIDS drugs. After six months of living in fear, they were sure that she was clear of any infection. However, three months later she was hospitalized for severe headache and found she tested positive for hepatitis C (Hensley, 1999).

After being diagnosed with hepatitis C, Black found herself unable to work but willing to talk. "If that needle-based system was not there, I wouldn't have been stuck," said Black. "If there's no needle, there's no needle stick" (Hensley, 1999). Unfortunately the hospital in which Black was stuck had a safer system available, but it was not required. Because no regulations had yet been in effect, the hospitals lack of use for a safer device was not enforced at the time of the accident.

Service Employees International Union

The Service Employees International Union (SEIU) Nurse Alliance is a group that fights for a safer work place, and has helped lead the way to the passing of the federal Needle-stick Safety and Prevention Act (Safer Needles, 2003). Since the act was passed, more than 24 states have implemented safer needle laws. Although safer needles prevent more than 80 percent of sticks, currently only about 15 percent of hospitals use them (Becker, 2000). Even after legislation is passed, it is difficult to enforce all hospitals to comply with these regulations. Today there are over 250 needles that contain features such as protective shields or mechanisms that automatically retract (recently approved by the FDA). However, it is up to the hospitals to decide whether or not they should use these products.

Cost Savings

It is estimated that a single case of HIV can cost $100,000, and one case of hepatitis C involving a liver transplant, can cost as much as $750,000. Hospitals and clinics need to look at the potential cost savings associated with the possibility of their employees being stuck accidentally. As pointed by the SEIU, "Even where no infection occurs, it costs up to $3,000 to treat an injured health care worker with prophylactic drugs when they've had a high-risk exposure (Safer Needles, 2003)."

VanishPoint Cost Analysis

To gain a more accurate reflection of cost savings associated with a safer needle policy, the manufacturers of the VanishPoint medical syringe developed a matrix comparing the cost of an existing syringe, at a Dallas hospital, to their own product. The Dallas hospital currently spends $0.05 per syringe while the VanishPoint product costs around $0.50 per syringe. Although there is a $0.45 price advantage in the traditional syringe, after comparing all the variables into the equation, a cost savings of $0.25 per syringe were found. This is due to three major areas in which VanishPoint's product soars over the traditional syringe. The first, most significant advantage is the cost of inflationary risk per syringe. This is the cost incurred for testing after a needle-stick occurs, as well as lost time and wages. The second cost advantage lies within the cost of treatment after a person is found to have contracted something. Since a large majority of sticks show negative to infection, this number is significantly lower than the mandatory testing that goes along with each accidental stick. The third and final advantage, the disposal cost of their product is cheaper (Cost Analysis, 2003).

Figure 4: Syringe Cost Analysis

Annual Costs	1,070-Bed Dallas Hospital	
	ExistingCost	Cost Using VanishPoint® Product
Volume of 3cc Syringes Purchased	427,600	427,600
Inflationary Risk Cost % of Salary	1.52%	-
Accidental Needle Sticks (ANS)	250	-
Probability of an ANS	0.000565	0
No Transmission of Infectious Disease	0.98235	0.98235
Transmission of Non-Fatal Disease	0.01765	0.01765
Transmission of Fatal Disease	0	0
Cost to Treat an ANS		
No Transmission of Infectious Disease	500	500
Transmission of Non-Fatal Disease	10,000	10,000
Transmission of Fatal Disease	-	-
Cost per Syringe Purchased		
Cost of Inflationary Risk per Syringe	0.52	-
Cost of Treatment for ANS per Syringe	0.11	-
Cost of Disposal per Syringe	0.05	0.03
Cost of Training & Prevention per Syringe	0.08	0.03
Purchase Price of Syringe	0.05	0.5
Total Cost of Syringe	0.8	0.55

Finding Price Advantages

The VanishPoint product, which costs $0.50 per syringe, was compared against a traditional syringe, which costs $0.05. However, according to the International Council of Nurses (ICN), the average cost of a retractable syringe was $0.24, while the cost of an average conventional syringe was $0.07 (Sew News, 2001). While there are advantages and disadvantages to every type of retractable syringe on the market today, a $0.26 difference is a dramatic saving.

California Finds Success

In 1998, California became the first state to take measures towards safer needle products. Although the legislations did not require the state to use specific products, it did require that all establishments and facilities who used needles to enact programs. All products that were used must be proven safer than their existing devices. It was not limited to just syringes. Scalpels, IV lines, and other sharp devices were included

(Noble, 2002). Since implementation, many hospitals and clinics have estimated cost savings, and all have reported lower cases of accidental needle-sticks.

Associated Costs Declining

As with almost every new product on the market today, the cost compared to conventional or existing products is usually dramatically more expensive. However, as these products become more commonplace and the machinery used to produce the product starts to pay for itself, the price almost always comes down. As Hensley writes in Modern Healthcare, "Manufacturers commonly charge twice as much for the safety products as for the traditional models they replace. Device makers attribute the price differences to startup costs, low manufacturing volume, and additional parts. They say prices will decline as demand picks up."

Laws and Regulations Enforce Use

If hospitals can't see the health and cost advantages of switching over to programs that use safer syringes, they'll surely get the idea when new laws and regulations come into place. The Occupational Safety and Health Administration (OSHA) has begun to incur penalties of up to $7,000 per violation to large group practices, clinics, and hospitals who are not complying with their new regulations (Garvin, 2002). Even small practices have been the target of such fines. Although most fines until now have been around $700 per violation, there is still the possibility of higher fines (Garvin, 2002).

Specific Regulations

To be in compliance with the new laws and regulations, practices will have to abide by new regulations. Although broad, they entail using safer medical devices complying with certain regulations. For example, using engineered sharps and needleless systems whenever feasible, evaluating and selecting safer devices, and maintaining a sharps injury log (Southwick, 2001). Health care workers see this legislation as a way to standardize the law and drive compliance at a quicker pace.

How Workers Can Ensure Enforcement

Because the vast majority of OSHA inspections are prompted by employee complaints, it is necessary for healthcare workers to voice their opinions if programs are not being followed to comply with the new regulations. Only a small amount of inspections are done at random, based on a computer-generated list of offices and hospitals. It is especially important for workers apart of smaller practices to complain because quite often they are not even on the list.

Disposal Advantages

When a typical syringe is finished being used, the one who performed the injection is then required to dispose of the device in a safe manner. Typically, at most hospital or medical environments, there are safe needle disposal sites. However, because the world is not a safe place and accidents can happen, employees can find themselves in danger of accidental needle sticks even after needles have been disposed. "While dis-

posing of uncapped needles into sealable containers (sharps containers) sounds like an ideal solution to the needle-stick problem," stated Ziff Medical Devices. "In actual practice, not all needles are properly disposed of, and needles stuffed into overfilled containers may still be dangerous." In fact, according to the International Health Care Worker Safety Center, 10 percent of needle sticks are caused due to improper disposal, while another 12 percent deals with disposal-related causes. Overall, disposal issues make up nearly one-quarter of all reported accidents.

Saving in Terms of Training and Disposal

Cost saving can also be found through the disposal of safety syringes. The disposal per syringe is typically half as much as traditional syringes, while the cost of training and prevention is also significantly less (Cost Analysis, 2003). As stated in Market Analysis done by Zif Medical, "Recapping the needle accounted for a higher percentage than any other activity at 14.1 percent." The advantage of not having to recap needles is directly reflected in the amount of necessary training when dealing with retractable devices compared with the traditional syringe. Disposal costs are typically less because retractable devices take up one-half the amount of space in a sharps container (Southwick, 2001). The ability of fitting twice the amount of syringes saves time changing the containers, as well as disposal cost associated with waste management.

Conclusion

Today more than ever, hospitals are starting to see the advantages of using retractable medical syringes. With more than 20 states now enforcing laws and regulations of safer devices, it won't be hard for other states to see the advantages. One of the problems associated with the hospitals today, according to Bill Borwegen, is that healthcare's culture "focuses on the needs of patients but not of workers" (Southwick, 2001). Hospitals must start recognizing the advantages of implementing programs and practices, not only to protect their patients, but to protect their employees as well. Today, through new laws and regulations, healthcare facilities are getting the push they need to start implementing their own programs. Furthermore, if protecting their employees from infection and even death isn't push enough, hospitals can find cost savings in retractable devices as well as in disposal and training advantages. Hopefully, other facilities will implement programs of their own after seeing success of hospitals using safer needles in the past couple of years.

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Plastic Sandwich

Nate Engebos
Undergraduate Student, Packaging

Introduction

Molders who use conventional injection molding machines should ask themselves this question. Why spend 25 percent more money than necessary? A co-injection system called Twinshot, will save a molder 25 percent on resin costs by using regrind, off-spec, or recycled material as core filler, while still producing the same higher quality part (Twinshot Defined... 2003). Also, there is no need to replace the existing injection molding machines because the Twinshot co-injection system can be retrofitted. It is as simple as a routine barrel change. With these advantages over conventional injection molding, there is no reason not to make the transition to Twinshot co-injection.

Co-Injection Background

The co-injection molding process is similar to conventional injection molding, except for one major difference. Co-injection uses a special valve configuration that enables two separate injection units to inject chemically compatible plastics through the same injection port. This process allows one material, usually the prime or virgin material, to form the outer skin of the part while a second material fills the center. Generally, the center (or core material) is a recycled, unpigmented, off-spec, or foamed resin material. Co-injection offers many cost saving and design benefits over the conventional injection molding process. These benefits include the ability to mold larger parts with less clamping pressure, reduced material costs, and the elimination of painted glass filled parts. Co-injection also aids the molder looking to make value-added products such as soft-touch parts or parts with a cosmetic surface over a glass-reinforced core.

What is Twinshot?

The process of co-injection molding uses only a single-screw and a single-barrel unit. This process, developed by Twinshot technologies, is making its way into the industry. John Rhodes, Twinshot Product Manager, states, "Injection molders throughout the world expressed an overwhelming interest in Twinshot upon seeing the technology demonstrated at the recently completed K-Show" (Retrofit Market License).

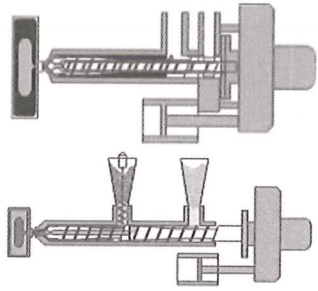
It is a design that can be retro-fitted to any conventional molding machine with little initial investment, still having the capabilities to inject just a single material. Unlike previous co-injection machines, Twinshot has a single conventional barrel design. The unit was designed with a solid screw enclosed within a second, hollow screw (Mapleston, 2002). Each screw independently processes a different melt stream. The melt stream is pooled in a common section of the barrel in front of the screws, with one material accumulating first, then the second. Then the pool of layered melts is

injected into the mold in one stroke. The well-known principle of fountain flow causes one material to cool against the mold walls and the other material to form the encapsulated core during the injection process. The all-in-one injection is significantly faster than other co-injection processes that inject materials separately.

The design requires no changes to the screw drive mechanism, new hydraulic requirements, software, manifolding, gate valves, new controls, or support equipment. In fact, this technology requires less floor space and uses less energy than a conventional co-injection system. The injection of both materials at the same time, from the same unit, eliminates timing problems. "Recovery time is much quicker, even faster than an equivalent conventional screw, because both materials extrude simultaneously," said Joel Thompson, inventor of the process (Rose, 2002). Conventional co-injection machines have to time each shot carefully; they cannot inject multiple materials at the same time. Also, the manifold is eliminated so there is no melt pressure loss, velocity, and shot size control. Further advantages of the Twinshot Version II include:

- Faster recovery, since both materials plasticize simultaneously.
- A broader range of screw sizes.
- Lower cost, since there is only one screw rather than two.
- A wider range of material combinations, using independent temperature control on the two materials.
- Production of soft-touch parts in a single molding operation.
- Easy conversion to single-material mode by supplying the same material to all feeder hoppers.
- An inner oxygen-barrier layer in packaging applications.

Twinshot Version II
This illustration shows the unit has one screw processing two materials.



Using Recycle

Material

The use of post-consumer recycled material as the core of a product can result in a huge savings in material costs (depending on the size of the operation). Because the material will be imbedded in a virgin material, there is no worry about possible contamination of foreign objects or irregular color tones. In today's environmentally conscious world, using recycled material is almost a must and the Twinshot system encourages it.

Increasing Appearance

When high glass content is required to meet stiffness requirements, painting the parts is usually necessary to achieve a high gloss. With Twinshot co-injection, the glass filled plastic is injected in the center and the non-filled resin is injected at the skin (Co-injection Produces). This creates a part with a resin rich surface, which requires no painting. Comparing that to a mono-layer conventional injection mold, it eliminates steps while improving the quality of the product, saving time and money.

Another Co-injection Method

There is another type of co-injection system currently being used in the packaging industry, a system that uses two different barrels to inject each material. The barrels are joined together by a common manifold and nozzle, through which both materials flow before entering the cavity. The nozzles are designed with a shut off feature that allows only one of the materials to flow through at any given time. To set up the process, the percentage of skin to core material is determined, and the two barrels are each programmed with the appropriate shot size. Barrel A generally holds the skin material and injects the set amount of polymer into the mold. This is followed by the core material in barrel B that penetrates the skin polymer and completes filling the cavity without breaking through to the skin surface. In the third stage, a small amount of skin material completes the injection, which completely encapsulates the core materials. However, this three stage process can be accomplished in just one simple step with a Twinshot system, thus increasing production speeds.

Cost Savings

Material savings are probably the biggest benefit of any co-injection technology, and Twinshot is no exception (Knights, 2003). The single greatest expense for custom molders is material costs and Twinshot has been proven to reduce these costs by 25 percent or more. Twinshot can usually replace up to 35 percent of a part's weight with lower cost material in the core. Molding parts with a core of recycled material that constitutes 30 percent of the part can save a molder approximately $42,000 a year by using a commodity resin. The cost of the entire system, retro-fitted to a conventional molding machine, should only cost about 20 percent of the total machine. One conventional co-injection machine costs around $270,000 versus a conventional molding machine with a retro-fitted Twinshot system at $200,000 (Knights, 2003). A conventional co-injection machine can take anywhere from five to seven years to pay off and a Twinshot co-injection system will be paid back within a year (Twinshot Defined, 2003). This will lower a company's overhead by $70,000 per machine. By simply looking at cost alone, there is no question as to what type of system to use. Also, higher quality parts will be produced at greater production speeds.

Why not Use Conventional Injection Molding?

Using a mono-layer injection molding machine, one can get a multi-layer product. However, it is a two step process that will not produce a quality product like a Twinshot co-injection system would. First, one material is injected into the mold. That mold is then transferred to another machine where the second material is injected.

When producing parts on two different injection machines, bonding between the two materials is not apt to be as good as on a Twinshot machine. Even when using compatible materials, the delay time may cause the first shot to be too cold. Plus, any dust or dirt picked up during the transfer will negatively affect the bonding process of the two materials (Ehritt, 2002). Delaminating of material will probably occur, leaving a defective product. Therefore, using a Twinshot co-injection system will produce much better products and ultimately make the company more money by increased sales and production. Twinshot co-injection molding systems can produce a wide variety of products that will perform better, cost less, and be more aesthetically pleasing for consumers.

Conclusion

Molders should consider switching from conventional injection molding to co-injection molding using the Twinshot system. Commodity resin alone will result in a net savings per year of $42,171.60 (Twinshot Defined, 2003). It will not only save money on material costs by using regrind, off-spec, and recycled material as a core filler, but it will also reduce overhead costs because the Twinshot system is 30 percent less expensive than a conventional co-injection machine. Also, the Twinshot system is easier to install and is more user friendly. With the combination of increased production speeds, reduced resin costs, and reduced overhead costs, the Twinshot co-injection system should be a consideration that every molder makes.

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How to Use Color in Food Packaging

Rob Kaszubowski
Undergraduate Student, Packaging

Introduction

When determining possible color options for a new product, packaging professionals must keep the consumer in mind. First, they determine what type of message the product should give. Based on the message, a color scheme that represents this message is chosen. This is why basic research is necessary, whether it's from previous case studies of similar products or from focus groups. Finally, packaging professionals must create an "attention" to the product, making it easily noticeable to the consumer. By following these basic steps, the package could be considerably successful. It may also instill a certain image or message into the consumer's mind that keeps them loyal for many years.

Understanding Color and its Importance

In order to be one step ahead of the competition and consumers, packaging professionals should research color schemes. Next, they must determine the exact demographics of the consumers they wish to target. Designers find this information useful and use it to decide on the package color.

The majority of packages today use characteristic color, which means that the color of the package is associated with the flavor. For example, an orange colored package is chosen to contain an orange flavored product. Uncharacteristic color would not be associated with the flavor. For example, an orange colored package containing a grape flavored product. The final scheme that is rarely used is ambiguous color, which means that the package conveys no color information at all. Examples of this are clear or colorless liquids (Garber and Hyatt, 318).

Color Lifestyle Groups

By determining the consumer demographics, packaging professionals can gain an advantage against the competition. This information can ultimately determine the main color(s) to be used on the package. There are three-color lifestyle groups that packaging professionals use; the Color Forward Group, the Color Prudent Group, and the Color Loyal Group. The Color Forward Group describes people who like to try a new color and will spend more for it, simply because it is new. Typically, women aged 30 to 50, men aged 30 and below, and all impulse buyers fall into this category. The Color Prudent Group will buy a new colored package only after observing someone else use it. These people are typically men and women aged 30 to 50, many of which can be described as careful shoppers. The Color Loyal Group tends to stick with safe colors, such as blue, black, and gray. People in this group are usually men over 60 years old and people who dislike shopping (Leichtling, 24).

Color Effects Consumers

After the importance of information regarding color has been described, one will have a better idea of color meanings. In food packaging, different colors can evoke different feelings and emotions in consumers. Packaging professionals must determine what message the product is intended to give off, and match color meaning with the product's message.

Color Meanings Change with Time

One thing to keep in mind is that color meanings change with time. Years ago, the color green was associated with vomit and other unpleasant images. However, today the meaning seems to have changed for the better, with green now seen as the color of nature. Green also tends to give consumers a feeling of healthiness. Consumers view green colored packaging as having fewer calories, more protein, and less fat. A few examples of green food packaging can be seen in Healthy Choice, meals and decaffeinated coffee.

Black is also another color whose meaning has changed with time. Years ago, black was simply related to death and depression. Now, black tends to convey a sense of elegance, wealth, and sophistication (Psychological Effects of Color, 2002). Although black is not very popular in food packaging, it is still used to make other colors in the package stand out. An example of this is the Mike's Hard Lemonade, package. Designers use yellow to characterize its lemon flavor, and also incorporate black into the label to signify elegance.

Color Meanings Change in Other Cultures

In different countries and cultures, colors have many different meanings. Just one color blunder could turn an entire country away from a specific product. A culture's distaste for a particular product due to its package can also lead to the consumer's dissatisfaction with the company itself.

Packaging professionals need to concentrate on this aspect even more now, especially because the U.S. faces far more ethnic diversity than ever before.

Examples of how Colors Differ in Different Cultures

Research has be done to determine what colors work and do not work in different cultures. For example, researchers have found that green tends to work well in the Middle East. On the other hand, it has been found that green packaging does not work well in China and France (Psychological Effects of Color, 2002). Green also does not work well in Egypt. This is because green is the country's national color, and consumers don't want this color used as disposable packaging (being consumed then discarded). A similar issue would be present in the U.S. if companies used American flag graphics on their disposable packaging. Most people probably wouldn't buy the product because they wouldn't want to throw the American flag, or its image, away. Another example is the color black in Hong Kong. Black lettering on a package would portray inferior quality (Leichtling, 27). Not all countries have the same views on color. This, in turn, makes packaging professionals work harder to cater to each country's needs.

Consumers' Product Views Change with Color

Packaging professionals have always known that different colors can evoke different emotions and feelings when used on certain packages; they only needed some solid evidence to support these theories. They hoped that by showing a focus group an original Gold Medal Flour, bag, along with eight different colored flour packages, they could prove that the group had different perceived views of the product, based solely on color.

This research took place during the mid-1990's, by a group of researchers, Garber, Burke, and Jones. They altered the color of the original package and created 25 new designs, including the original. They were eventually narrowed down to nine designs that would be ideal for a test. The text and graphics on the package was kept the same. However, the background color of the bag was changed. Next, the focus group was asked to indicate which of the nine all-purpose flours characterized each of the packages. They were told to base their assessments solely on package appearance. After the results were tallied, the original Gold Medal package was described as: good tasting, good value, naturally pure, and fresh quality. The black colored bag was identified as inexpensive, exclusively based on the color of the package. The focus group described the orange and yellow bags to be vitamin-enriched. The green bag was perceived to taste good. The light blue bag was identified as having been pre-sifted (Garber and Hyatt, 328).

This package study shows that large color changes to an existing package can increase the likelihood that new customers will consider the product for purchase. However, the package color must be consistent with the brand's original identity. The study shows the direct effect package color can have on consumers and their image of the product inside. Even though the product inside the Gold Medal Flour bag never changed, the individuals in the focus group identified numerous perceived meanings based solely on the new package color.

Products Fail with Wrong Package Color

When designing new packages for new products, designers must perform basic research before determining the package's final color scheme. As seen in the previous example, the color of the package alone can suggest different meanings to the consumer, regardless of the product inside.

For example, there was no color research conducted by PepsiCo, before Crystal Pepsi,, a new product, was put into stores. PepsiCo started to produce this new product without performing any focus group studies. They had no idea of how it would sell. Crystal Pepsi was a clear soda, unlike other regular PepsiCo products, which were dark in color. PepsiCo was simply trying to take advantage of a new package color phenomenon, clearness. Ivory, had originally started the fad with its clear dishwashing liquid. They had successfully changed the color of the liquid from creamy, milky white to clear. This drew in consumers due to its eye catchiness. It also gave them a sense of excitement toward a new version of the same original product.

PepsiCo believed that they could succeed with this clear visual marvel by rushing Crystal Pepsi into the market. However, PepsiCo had failed to understand that color suggests more than sensory experience. In Crystal Pepsi (and other food prod-

ucts), color creates flavor and performance expectations. When consumers purchased the new Crystal Pepsi product, they expected to taste a product that had a light flavor and contain fewer calories than other cola drinks. Once consumers actually tasted Crystal Pepsi, they were immediately displeased when they found that it tasted just like regular Pepsi. The new product soon failed as consumers could not connect the flavor to the color (Garber and Hyatt, 313).

Cereal Popularity Depends on Color

After performing some basic research on the effects of color, it was interesting to see if package color had any effect on cereal sales and which colors were the most popular among cereals. Because most people eat cereal, it was chosen as the product of research due to its large sample size and popularity.

Typically, blue is not found in food packaging because people want to associate the color of the package with the color of the product. Aside from berry-flavored products, there are not many products that use blue as its characteristic color. I believe that blue is also a popular choice in cereals because companies need their product to stand out against their competitors. Not every cereal flavor can have the popular, attention getting colors like red, yellow, and orange. Blue gives the cereal packages an additional way to stand out against the other brands.

Yellow is another popular color found in cereal packaging. One of the most popular brands that use this color is Cheerios. Yellow is the fastest color the brain processes, and therefore is usually a good attention getter. It is also an appetite stimulant and tends to make people feel cheerful and optimistic (Tufts University Health and Nutrition Letter, 1999).

Another color that can often be found in cereal packaging is red. Red tends to make people feel excited, full of energy, and can actually increase the heart rate. Like yellow, red is also an appetite stimulant. According to Eric Johnson at the Institute for Color Research, when the eye sees red the pituitary gland sends out signals that make the heart beat faster, the blood pressure increase, and the muscles tense (Supermarket Psych-Out, 1999). These are all psychological changes that can lead to the purchase of a product. Red is also said to be a "warm and inviting color," according to Paul Break, a Boston-area product designer. Other popular examples of red food packages include Campbell's soup, Marlboro cigarettes, and Folgers coffee.

Top Cereal Sales

The top five selling cereal brands in 2000 were (in order), Cheerios, Frosted Flakes,, Honey Nut Cheerios, Frosted Mini-Wheats, and Raisin Bran, (The Top 10 Cereal Brands, 2001). Each of these brands uses one of the top five used colors as their package color: yellow, blue, orange, red, and brown, respectively. This example shows product longevity and how it can relate to package color. Other brands that have tried to imitate or copy these best selling products usually never make it and become discontinued. Today, even makers of the generic brands of these products tend to copy the best-sellers color scheme, simply because they know it works well.

Conclusion

When choosing packaging options for new or current products, packaging professionals need to look at the package through the consumer's eyes. Certain colors evoke certain emotions and send out meanings. When used correctly, the color scheme could noticeably boost a product's sales. However, when a color scheme is used incorrectly, the product could end up a complete failure. Also, colors do not possess the same meanings in all cultures. By performing some type of basic research on the preliminary design, packaging professionals will be able to have a better idea of what will and will not work. Finally, with competition among brands so close, packaging professionals need something to give them an edge over the competition. By following these simple guidelines, package color can be that edge. At the end of the design process, one will have a package that will stand out, rise above the opposition, and keep the consumer coming back for years to come.

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Use As Directed

Travis J. Strom
Undergraduate Student, Packaging

Introduction

The growing concern within the pharmaceutical industry is the role that packaging plays within the doctor-patient cycle. Prescription medications are administered to the patient and it is assumed that the correct type, dosage, and amount will be given. According to the Food and Drug Administration (FDA), 1.3 million people are unintentionally harmed every year in hospitals and in-patient healthcare facilities because of improper medication use and medical device failures. Moreover, the FDA states that prescription drug packages and labels that are misunderstood by the caregiver cause many of these problems (Mayberry, 1998). With the increasing number of prescription drugs and medications being used by consumers today, special attention must be paid to the packaging and its role in terms of child-resistance, senior-friendliness, and its overall convenience.

Safety Concerns of Current Drug Packaging

Packaging is expected to help reduce such medication errors. New senior-friendly packaging should help reduce the one million yearly calls about ingestions to poison control centers, 130,000 hospital emergency room treatments of poisoning, and 50 poisoning deaths to young children (CPSC, n.pag). The Harvard School of Public Health cited research indicating that as many as 10 percent of all patients experience an adverse drug event during hospital treatment, even though only 0.2 percent of these events are reported. This statement is based on quantification efforts undertaken by Harvard to objectively measure the number of adverse drug events that have occurred within the University's hospital system (Mayberry, 1998).

In recent years, both the healthcare industry and the general public have become more aware that poor patient compliance leads to failed medication regimens. There also seems to be an increased awareness of how labeling and packaging, especially unit-dose packaging such as blister cards, can help patients with compliance. One hospital reported a 70 percent decrease in errors when its pharmacy switched to bar-coded, unit-dose packaging (Swain, August 2000). Along with the issues of medical errors, other dilemmas regarding pharmaceutical packaging arose, including patient compliance to their regimens. Bill Arden, marketing manager at TL Systems Corporation Bosch Group stated, "Patient noncompliance in a drug regime is one of the biggest problems a doctor can have and is becoming bigger as the population ages" (Erickson, 1998). A report done by the Institute of Medicine indicated that an improved package could help. Unit-dose packaging is particularly suited for this task. This type of packaging has the ability to not only protect children and be potentially senior-friendly, but it can also be used to inform the user. Doctors can write all of the

regulations that they want, but it is in the patient's hands when the patient takes the medicine home. The use of unit-dose packaging can prevent and substantially reduce the number of poisoning incidents that occur each year.

Medication errors are also associated with poor product packaging design. Severe toxicity and death due to overdoses of certain drugs usually appear to be the same as other less toxic drugs on the packaging, but in fact they are not (Proulx, 2000). Manufacturers should take precautions during the design process to prevent such tragic mistakes as the overdoses, considering there are at least 29 cases per year (Proulx, 2000).

To combat this issue of brand recognition, typeface is being considered to enhance distinctive portions of look-alike drug names on look-alike packaging. Hopefully, the introduction of unit-dose packaging into the diverse group of prescription medications will have a positive effect on the industry.

Daily, physicians, nurses, and pharmacists base medical decisions on information provided by a drug product's labeling and packaging. Unfortunately, poor labeling and packaging have been linked all too often to possible cases of medication errors (Proulx, 2000). Unit-dose packaging can be considered a solution to the safety concerns that arise when prescription medications are involved. Only when the industry, government, and consumers begin to carry out their individual responsibilities, can we effectively reduce the number of ingestions and poisonings that occur each year in the U.S. When one in ten patients is found to be experiencing adverse drug events and credible sources have identified potential solutions, immediate action should be taken (Mayberry, 1998).

Regulations and Blister Packaging

In the debate concerning efforts to encourage the use of unit-dose packaging, there are several regulations and market developments that are pushing many manufacturers to pursue new designs.

Unlike bottled medication, blister packaging is designed to keep each dose fresh until needed. To ensure that blisters actually do protect their contents from moisture, humidity, and other environmental hazards, drug packagers need to subject the packages to a series of environmental challenges known as product stability tests.

The code administered by the FDA, section 211.166 of title 21, mandates the performance of stability testing. The results of this testing shall be used in determining appropriate storage conditions and expiration dates (Allen, 1999).

In the latest developments regarding stability testing, FDA guidelines changed the accelerated stability test from 3 months at 38 degrees C, 90 percent RH to 6 months at 40 degrees C, 75 percent RH (Beagley, 1998). Such changes in testing protocols will make new packaging designs more challenging. Engineers must consider using new materials that will increase the barrier properties and comply with the modifications made to the Poison Prevention Act of 1970.

The Poison Prevention Packaging Act (PPPA) was ratified recently to protect young children from accidental ingestion of harmful substances. As seen in Figure 1, the passage of the PPPA requires the use of child-resistant packaging, the commission estimated that over 700 children's lives have been saved from accidental poisonings by

prescription drugs and aspirin alone (CPSC, n.pag).

Some children however, continued to be poisoned. Many adults who have had difficulty opening bottled packages defeated the purpose by throwing the caps away. Transferring hazardous substances into other non child-resistant packaging has been another problem. Under the original PPPA regulations, packages were tested with panels of children less than 5 years of age to ensure child-resistant packaging was difficult to open.

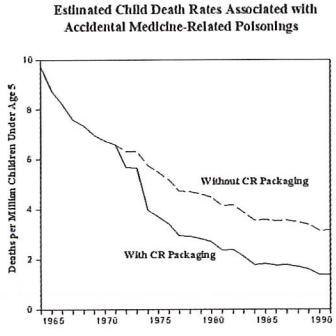


Figure 1: Child Death Rates

Manufacturers also tested panels of individuals 18 to 45 years of age to ensure that adults could use the packaging as well.

Unfortunately, despite this testing, many adults, including the elderly, still had trouble opening the packaging. In June 1995, the U.S. Consumer Product Safety Commission (CPSC) voted unanimously to issue a final rule modifying the child-resistant packaging test protocols of the PPPA (CPSC, n.pag). These changes revised the testing methods, which made packaging senior-friendly and easy to open while maintaining their child-resistance. The CPSC's decision changed the make-up of the test panels, from individuals 18 to 45 years of age to individuals 50 to 70 years of age. This gave a better understanding of the abilities of normal adults using child-resistant packaging.

Approximately 20 percent of the children being poisoned by pharmaceuticals were poisoned by their grandparent's medicine (Beagley, 1998). Such statistics show that the older adult populations were not effectively opening and closing their prescription medicines, which resulted in the Poison Prevention Act to ensure the safety of children. The modification of the law will force most drug manufacturers to look for new, innovative packaging to accommodate the physical demands of their sensitive products. Unit-dose packaging provides a positive answer to the pending dilemma of adhering to regulations while preserving the integrity of sensitive medical products.

The CPSC revised its regulations with intent to protect children from accidental poisonings, not to disrupt the pharmaceutical industry. Fortunately, the industry has shown strong support by taking a common sense approach to packaging designs and testing.

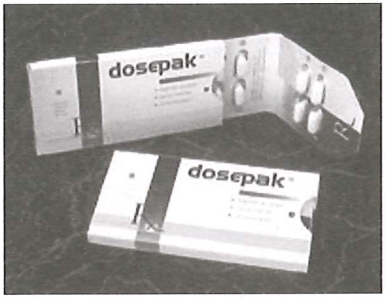
The CPSC and the industry cooperated to prevent future deaths and poisonings of children. Hopefully, this will reduce the risk of child poisoning from medicines transferred to non child-resistant packaging or from packaging where the tops are left off. When the CPSC revised its protocol, requiring that drug packages be senior-friendly as well as child-resistant, blister packaging designers were faced with a challenge.

The Role of Unit-Dose Packaging in Pharmaceuticals

Many manufacturers, who had previously sealed their packages tightly to keep children out, had not taken senior-friendliness into account. Some blister packages will continue to be made that way, because the protocol allows a unit-dose package to pass the senior-friendliness test by the use of opening it with scissors (Swain, February 2000). Blister manufactures must look for innovative ways to design new packaging that complies with child-resistance and senior-friendly regulations for many reasons. Simply calling for the use for scissors will not work for a growing number of new drugs that must be packaged in blisters because of their high toxicity levels. In some cases, if a senior citizen skips a dose or stops taking the drug because of frustration over the packaging, it could result in a life or death situation. The phrase "open with scissors" or "cut here" enables the packages to be opened by a senior test panel (Swain, February 2000). However, it cannot recommend using a scissors icon on the package showing where to cut. A child will recognize that icon, get the scissors, and be able to get into the blister. When considering the use of scissors to open blister and unit-dose packaging manufacturer should "say it," but don't "show it" (Swain, February 2000).

The danger of introducing child safety precautions may compromise usability of packs with less dexterous people. However, the latest change in safety standards provides a huge opportunity to rethink medicine packaging designs. Historically, when designers have achieved child-resistance in their packaging designs, it had commonly come at the expense of senior-friendliness, but now there are several options to overcome these conflicting requirements. As a result of the change in packaging protocols, there is a new blister package design whose opening features use an entirely different set of parameters. Instead of relying on force, which troubles seniors, to open the package, these designs accommodate certain abilities that seniors possess and children do not. For example, reading comprehension, the ability to follow several numbered tasks, and ability. The task of designing a package that focuses on cognitive ability to open rather than strength is to limit the number of movements to simplify opening. Designers must limit to three or fewer movements until the product can be reached, otherwise, people may not remember how to open it (Swain, February 2000). The first generation of child-resistant blisters has been creative, but also labor intensive. An example of a newer unit-dose package is the Dosepak‰ from Mead Westvaco Corp., Some of these solutions are incredibly expensive, particularly if you are only doing a small run of 3,000 to 4,000 packs, because of set up costs. However, the company has sold 2.6 million Dosepack units since the CPSC regulations went into effect (Polin, 2002). One-third of the orders they received have been for trials requiring 4,000 units or less (Polin, 2002). The new Dosepak contains three main design elements: an outer carton, fold over inner blister card, and a unique locking feature.

Figure 2: Dosepak



It features an inner blister sealed to an outer paperboard carton. This provides child-resistance through a locking mechanism that children don't realize exists. Once the locking mechanism is released and the package is opened, the individual blisters make it easy for seniors to open. The carton also has a tear-resistant laminate, because ripping is the most common way children try to get into blister packaging. In addition, Mead Westvaco's category manager, Michael Hubble, mentions that the carton provides ample room for compliance-related information, and the paperboard is hard to dispose of because it is attached to the blister, meaning that the child-resistant feature and the labeling always remain (Packaging Digest, July 2001).

"The focus of these concepts is on cognitive ability," said Patrick H. Dent, technical coordinator of pharmaceutical and healthcare markets for Reynolds's Global Packaging Group. "Many seniors don't have the dexterity or strength to open conventional packages" (Swain, 2001).

Dosepak offers other advantages as well. For pharmaceutical manufacturers, Dosepak can be used in clinical trials, where the toxicity of a drug may still be unknown, and then commercialized simply by changing its graphics. Dosepak helps consumers to maximize effectiveness and follow regimens, such as taking medication with meals or at certain times of the day, by allowing manufacturers to incorporate graphics, icons, and other instructions on the interior and exterior of the package.

Another option that Mead Westvaco offers in regards to unit-dose packaging is the Surepak. Surepak consists of a tear-resistant paperboard cover which is wrapped around a high-strength plastic frame. A proprietary locking mechanism on one side of the frame snaps closed over the cover and holds it into place. When the lock is disengaged and the cover lifted, an inner blister card attached to the underside of the cover lifts it. When the cover is closed, the blister card rests back inside the frame, leaving space for CD-ROMS, product brochures, safety and compliance guidelines, and other product information (Design Week, 2002). According to Mead Westvaco, Surepak has achieved a child-resistance at the F=1 level, the safest U.S. government rating for medical packaging. That rating also means any inner blister card used with the new package will carry the F=1 level as well (Gale Group, 2003). An F=1 rating indicates that in a test group of 50 children, only one child was able to open the package within a five minute window. After several redesigns, the package was able to pass the CPSC testing protocol without any children gaining access to any pills, so it can be used for the most toxic drugs (Gale Group, 2003).

In addition to prescription drugs, Surepak is said to be suitable for nutritional supplements and other healthcare products. The senior-friendly inner blister card extends product shelf life and offers space to guide consumers through the correct dosage regimens. These new packages can be used in semi-automatic or high speed filling environments and can be customized in any size or color. Manufacturers can still make the switch to unit-dose packaging while not compromising their manufacturing processes, this makes Surepak more desirable. Blisters promote compliance, more so than bottles, by presenting a means by which a patient or subject will know what dose was taken last and/or what dose was missed.

A 1991 study found that elderly patients using unit-dose calendar packaging were more likely to comply with their regimens than those using bottles or other non-calendar packs. The users of calendar packages led in compliance rates by 86.7 to 66.7 percent (Swain, 2001).

Another reason for the increased interest in designing compliance packages is the transition of certain drugs from multi-doses per day to one dose per day or even one dose per week. If a dose is missed there is a greater effect, therefore compliance becomes more critical.

Perhaps the most significant advantage that unit-dose packaging and blisters have is their set of clear directions, telling when one should take the medication. This advantage enables the consumer to be well informed regarding dosage, frequency, and product warnings.

Industry Outlook

The use of unit-dose packaging is rapidly expanding in the U.S. There has been a growth in unit-dose packaging for the healthcare providers, specifically in hospitals, prisons, and nursing homes (Erickson, 1998). What seems to attract these providers to this type of packaging are issues of self-medication and positive identification of the product. When considering the issues of unit-dose packaging and its growth within the industry, one must realize that the amount of people using medications has increased as well as the diversity of medications. Industry insiders and observers generally agree that the use of blisters, including unit-dose packaging, will grow by at least 12 percent per year (Erickson, 1998). The greatest advances in market share are projected to come from blister packages, which are predicted to reach $1.045 billion in 2004 (Swain, August 2000). These numbers are very promising when compared to other various types of packaging used in the pharmaceutical industry. The projected growth of blisters and unit-dose packaging shows a wider industry acceptance of the packaging design and the willingness to protect children while not compromising ease of use.

Figure 3: Pharmaceutical Packaging Demand in Millions ($)

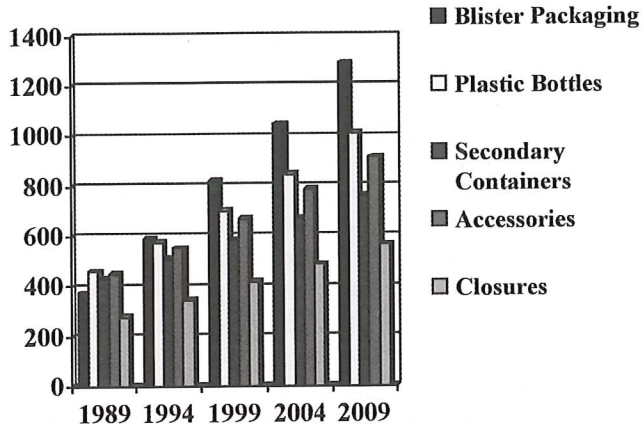
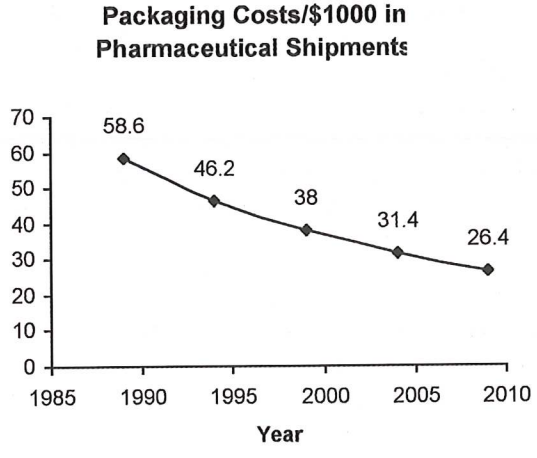


Figure 3 compares the various types of containers used in the pharmaceutical industry, and specifically outlines the growth of blister packaging compared to the growth of other drug packaging. Historically, the growth of blister packaging has been steady. Now that the use of unit-dose packaging has been projected to gain more industry acceptance, that number is expected to rise to approximately 12 percent per year.

Figure 4: Shipment Costs



Along with an increase in blister sales, Figure 4 shows the cost of packaging per pharmaceutical shipment is dropping significantly, according to the Freedonia study. In 1989, drug companies spent $58.60 on packaging for every $1000 in pharmaceutical shipments. In 1999 that dropped to $38.00; it is expected to drop further to $31.40 in 2004 and $26.40 in 2009, indicating that drug companies are as serious about keeping packaging costs down (Swain, August 2000).

Two key points regarding the industry acceptance of unit-dose packaging are the initial setup costs and the concerns as to whether the new packaging designs will be profitable. Warner-Lambert, the producer of the cholesterol-lowering drug Lipitor, can be used as an example. According to Thomas McMurray, Warner-Lambert's Director of Packaging Technology, in 2000 alone the company lost nearly one billion dollars in sales. The majority of those losses were due to patient non-compliance. McMurray explained that in the next year, patient termination of the drug based on non-compliance may reduce the drugs revenue by an additional ten billion dollars nationwide (Allen, 2000).

Unit-dose packaging, however, may be able to turn such losses into gains. "Sixty percent of patients stop taking Lipitor after six months, and such non-compliance is common with other drugs," said McMurray.

If drugs were to be packaged in unit-dose packaging such as blister packs, patients would have a daily reminder and record of their regimens, and therefore a greater chance of adhering to them (Allen, 2000).

However, the same manufacturers who fear non-compliance may shy away at the thought of placing all of their drugs into unit-dose packaging. Material, equipment, tooling, and labor costs associated with unit-dose blister packaging are often high enough to deter companies that are accustomed to using bottles.

Drug makers may be able to increase their product value enough so that volume increases actually lead to a "break even" point in costs between bottles and blisters (Allen, 2000). The key is to find the knee in the price/volume curve, which is the point at which the cost floor of high-volume production is in sight. At the beginning of the curve, manufacturers must pay for development, tooling, and production costs, whereas at the end, manufacturers only pay for materials. The point is, to be able to reach the end of this price/volume curve; manufacturers must get volume up to get cost down. The key to increased volume is to convince patients, practitioners, and buyers of the value of unit-dose packaging (Allen, 2000). If drug manufacturers can convince users of the value of packaging that encourages regimen compliance, more manufacturers may be able to afford and profit from a packaging technology that could help save lives, while not compromising ease of use.

Conclusion

The unique characteristics of unit-dose packaging offer a positive solution to the issues that the medical and pharmaceutical industries face. The new packaging allows consumers to safely follow their drug regimen through clear labeling and instructions, ease of use, all the while providing the relief of child-resistance. Unit-dose packaging has increasing industry acceptance and the potential to dominate the pharmaceutical market. With advances in material and packaging designs, unit-dose packaging will continue to grow in the medical market.

Hopefully, with the increased popularity of the packaging, there is a decrease in accidental poisonings, medical errors, and deaths. Unit-dose packaging can be considered a new technology in the market, with the potential for great success. Only those companies ahead of the game will reap the benefits.

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Choosing the Ideal Integrity Test

Michael Grindle
Undergraduate Student, Packaging

Introduction

Determining which medical package testing method to use involves a variety of independent considerations and decisions. To begin, it is important to understand the importance of medical device package testing. Making the right decision can benefit a company's manufacturing practices and quality of the products to its end users. After the importance is understood, there are several factors that must be considered when choosing the ideal integrity test, including:

- Material properties, such as whether they are a porous or non-porous
- Allocated testing budgets
- Appropriateness of a destructive or non-destructive test
- Desired level of accuracy
- Integration of testing into current packaging process
- Obtaining Food and Drug Administration (FDA) approval by following standards

Importance of Medical Package Testing

The U.S. has seen a recent spike in medical packaging growth. Demand is expected to climb 5.4 percent by 2005. The growth is a result of stricter infection control standards, an aging population that is requiring more medical services, and more convenient and flexible package designs (Sterile Packaging, 2001). With an increase in the number of medical products being packaged, companies are looking for ways to improve their processes, while at the same time maintaining costs and meeting the growing demand. This growth stresses the importance for companies to develop quality-manufacturing practices. These practices can help the company guarantee the integrity of their packages.

Package integrity is the "unimpaired physical condition of a final package" (Franks, 2002). Basically, it means that a package meets the required minimum physical properties and specified seal strength. Package integrity guarantees that a package's sterility is maintained. It is a measure of its sterile barrier (Franks, 2002).

Package leakage is also a measure of integrity. Any defect presents possible loss of product sterility, therefore these test methods are designed to detect material or process failures (Franks, 2002).

Package testing is essential in medical device manufacturing. If a package fails, the sterility of the product is at risk (Beagly, 1998). The two main reasons for testing are: to ensure integrity of a sealed package and to ensure no defects developed during sterilization, product handling, transportation, and/or storage. Testing can be done to find leakage resulting from large holes, pinholes, cracks in the materials, and/or failed

seals (Franks, 2002). It also provides insight into how the package/product will perform in real life situations. Testing of package integrity is also done to provide information on how effective a company's manufacturing processes are performing. When medical device manufacturers designate a product for use in the medical field, they must assure the user that the package has been examined and has passed testing standards set by the FDA (Franks, 1999).

Beyond understanding the importance of medical packaging, a packaging company must take various factors into consideration when choosing an appropriate test method.

Package Compatibility

Manufacturers, based on compatibility with the product, choose their own test methods. Medical packagers can use either non-porous materials, such as films, coextrusions or laminates (including foils). They can also use porous materials, such as Tyvek® or paper for part of the package barrier wall. Porous materials are predominant in the industry, due to extensive use of ethylene oxide (ETO) sterilization methods. The nature of porous materials may limit the amount of test methods and equipment. (Franks, 2002).

Using non-porous materials allows a packaging company to choose from many leak detection test methods. Leak testing would not be appropriate for a company that uses porous packaging materials, because by nature, porous materials leak. Although there are systems that can test for leaks in a porous package, they are generally too expensive for the average medical packaging company to afford. The most common test method for porous packages is visual inspection, which relies completely on the thoroughness of an individual. This, in turn, is not very reliable. Dye penetration, another example, involves injecting dye into the package. The inspector then observes to see if any dye leaks through the seal. This is generally a good choice for packagers that use porous materials because it is effective, inexpensive and fairly easy. However, it is also very messy and destructive to the product (Leventon, 2001).

For packaging companies that use both porous and non-porous materials, there are applicable tests for both types of packages. These methods are burst, creep, creep-to-failure, vacuum jar bubble and trace gas testing. Each method requires specific techniques and trained expertise to be performed properly (Variables, 2003).

Cost Considerations

Cost is one of the most important factors when choosing the ideal test. Purchasing and laboring expenses need to be considered. The price of equipment can range dramatically, depending on the test method and automation of the process. In general, more automated processes may result in lower operator costs. However, the highly automated systems may be even more expensive. Not only because they are more complex, because they may require more upfront costs in order to understand the equipment and train new operators.

The bubble tank method is one of the least expensive methods to purchase and set up. But it can result in high costs when the need for supplementary equipment and extensive technician time are factored in. Examples of supplementary equipment are dry-

ing and conveying systems (Leak Detection, 2003).

The cost of pressure decay systems can range dramatically because the systems can be purchased at varying levels of automation. The highest of automated systems interface with process control computers and can cost as much as $100,000. Pressure decay systems also require supplementary equipment, such as special chambers or jig constructions that create a sealed environment (Leak Detection, 2003).

Trace gas leak detectors require the packaging company to construct positive pressure environments and exhaust systems. But unlike the two previously mentioned tests, the largest expense of this test comes from the gas itself. Choosing the right gas to use, such as helium, can reduce the cost. Helium is one of the least expensive gases and is also self-exhausting. Another cost reduction method includes purchasing a system that includes a gas recovery system. This system can usually recover up to 60 percent of the gas used (Leak Detection, 2003).

On the high end, mass spectrometers are the most costly test system to purchase. They require a vacuum environment, including vacuum pumps. These pumps add to the upfront costs and also increase the time necessary to complete each test (Leak Detection, 2003). Below, Figure 1 compares the cost of these tests with other common test systems.

Figure 1: Cost of the Various Test Systems

Detector Type	Equipment Price Range	Operating Cost Perameters
Bubble Test	$1,500 - $50,000	Operator, heat for water, heat to dry components
Helium Mass Spectrometer	$20,000 - $150,000	Electrical power, helium gas, vacuum source
Pressure Decay	$5,000 - $20,000	Factory compressed air systems, electrical power
Dynamic Flow	$3,000 - $15,000	Operator, factory compressed air systems, electrical power
Electron Capture	$8,000 - $12,000	Operator, argon ($1/day), trace gas 1-10% with dry air
Thermal Conductivity	$1,000 - $2,000	Operator, trace gas (depends on application)
Acoustic	$1,000 - $4,000	Operator
Hand Probe Mass	$10,000 - $20,000	Electrical power spectrometer, helium gas, operator

Overall, the costs related to package leak detection testing are incurred upfront. These costs include purchasing systems, set-up, and throughout time, the cost of operating and performing the test. Set-up expenses can include constructing supplemental systems, training the work force, and purchasing any additional test operating parameters.

Destructive v. Non-Destructive

When choosing a test method, another issue is deciding whether a destructive or non-destructive test is appropriate for the process and package/product. Cost is an important factor when making this choice. A non-destructive test is performed without harm to the product. A destructive test, on the other hand, is conducted in a manner that destroys the product, in order to prove package integrity. Cost becomes a major factor if the product contained in the package is expensive. Every package tested results in product loss. Using a non-destructive test method results in minimal product loss for the company. For example, the pressure decay test method is non-destructive to the product. However, it uses a port to inflate the package until it reaches an established pressure. This test measures the amount of pressure loss over time. Even though this test method is non-destructive to the product, using this port to inflate the package renders the package unusable after the test is complete. In other non-destructive test methods, such as the vacuum decay test method, the package is not harmed during testing. The package is placed in a vacuum chamber. There, the package is subjected to the vacuum and the pressure change is measured over time to indicate any leaks. The advantage to this test is it allows the packager to test 100 percent of their packages without any product loss (Allen, 2002).

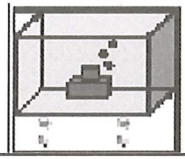
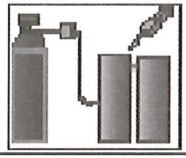
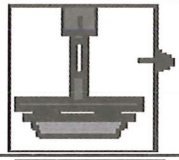
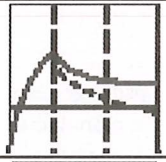
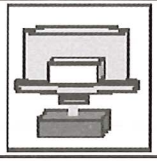
Although choosing a non-destructive test has many advantages, choosing a destructive test with a lower start-up cost may be more appropriate. When the company is packaging a relatively inexpensive product, destructive testing would not result in a large profit loss over time.

Accuracy

Another key factor to consider is the sensitivity of each test. Currently, there is no industry standard for testing sensitivity. It is up to manufacturers to consider their objective and determine which test is appropriate. Many companies assume that choosing the test that detects the smallest hole is the best decision. But in medical packaging, there has been no correlation found between the size of the defect and contamination when microbes are present. Choosing the test that detects the smallest hole is often more expensive and not necessary (Leventon, 2001). Choosing a test that is ultra-sensitive could, in effect, render a process incapable of producing packaged items that meet specification limits. Basically, according to ISO 11607 (Standard for Packaging Terminally Sterilized Medical Devices), manufacturers should show that their package will still be sterile after it has been through its normal process handling and aging cycle. Figure 2 compares the sensitivities of various common tests.

It is important to examine other considerations before choosing a test with a certain level of accuracy. As stated earlier, test sensitivities are important in making a choice on which test to use, but striving to use a test that finds that smallest possible holes may not be necessary or economical.

Figure 2: Test Sensitivities

Detector Type		Sensitivities
Bubble Test		10^2 to 10^3 sccs with vacuum
Trace Gas Sensing		10^4 to 10^5 sccs (helium)
Force Decay Test		10^1 to 10^3 sccs
Pressure/Vacuum Decay Testing		10^4 to 10^6 sccs
Mass Spectrometry		10^9 to 10^11 sccs (helium)

Inline v. Offline

When and where testing will occur are also factors to consider when choosing an appropriate testing method. If a company desires to test their packages inline during the packaging process, there are many logistical factors to consider. For example, how the newly purchased testing system will be integrated with existing equipment (In-line Versus, 2002). Many machines, such as the system for helium mass spectrometer, are very large and would require major changes in order to be integrated into a current packaging line. Some manufacturers are offering customized systems to make integration easier and less costly (Allen, 2002). A major advantage of this method is that it allows for 100 percent inspection without adding excessive time and labor to the existing process. According to Steven Franks of T.M. Electronics, "One hundred percent inline testing is the ideal. It would be the most effective use of a non-destructive test. It would provide maximum use of technology, prevent waste, and provide lower costs by not requiring the use of large amounts of labor" (Allen, 2002). If inline testing is not an option, offline testing should occur. Space considerations will still need to be made and the process for moving the packages offline to the testing areas will need to be established.

Supported by Standards

When a medical device manufacturer designates a product for use, the end user must be assured that the product/package has been examined and has passed testing standards set by the FDA. Manufacturers must also follow guidelines set by either the International Standards Organization (ISO) or the American Society for Testing and Materials (ASTM) (Franks, 1999). ISO 11607 is an international standard that provides guidelines for designing, manufacturing and testing a package. ISO 11607 also provides a listing of supporting documentation necessary to validate the package design and its ability to meet standard specifications. Both the FDA and international regulatory bodies are increasingly requiring compliance with ISO 11607 (Regulatory Requirements, 2003). ISO 11607 includes a list of package tests in its appendix. The list gives a manufacturer a variety of choices when choosing a testing method.

When deciding on a test method, considering one that is supported by ISO and/or ASTM standards may be helpful. This allows the manufacturer to follow procedures that are consistent with other companies conducting the same test; it eases the validation process and helps gain FDA approval. FDA approval helps gain customer confidence, due to the standard's guarantee that a terminally sterilized package will maintain its designed performance over the intended life of the product and will not fail during transport or storage (Some Fundamentals, 2002).

Conclusion

In conclusion, medical device package testing has been discussed in many aspects. All these factors contribute to a manufacturer choosing the ideal integrity test. In the medical industry, it is important to maintain a high level of assurance that the integrity of the medical package may not be compromised. This integrity gives both the manufacturer and purchasers confidence that the sterility of the product will be maintained. Incorporating good manufacturing practices and utilizing the proper test methods can achieve this confidence. A medical device packager will benefit greatly from making the right choice, not only in the eyes of its customers, but to the end users as well.

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Patent Pending

Amy Baumann
Undergraduate Student, Packaging

Introduction

Patents have long served as a fundamental component in American inventions. Today, we live in the land of Thomas Edison, Alexander Gram Bell, and the Wright Brothers, where our government promotes the Progress of Science and useful Arts (Gleick, 2000). Inventors give up secrets, in lieu of the glory of seeing their work get published, in exchange for a 20-year government sanctioned monopoly.

Since the 1790s, many amendments have occurred. In 1952, the Patent Act under Section 122 was enacted, and recently President Clinton signed into the Intellectual Property and Communications Omnibus Reform Act of 1999 (Sievers, 2000). In 2001, another problem arose in patented packaging in the case of Traffix Devices Inc, v. Marketing Displays Inc,. (MDI). The court ruled that after a utility patent runs out, normally after 17-20 years, the company cannot then keep competitors from using packaging design by threatening to sue them for theft of "trade-dress" (Barlas, 2001).

Background Information

There are two types of patents discussed: design and utility. A design patent is directed toward the non-technical features of a package, the new and original shape or the combination of the shape and color of a product. A design patent can also be classified by the aesthetics of a package. A utility patent, however, lends its focus to an inventor of a useful process, machine, or any new or useful improvement. A utility patent is filed when the shape of the package has a technical effect.

Generally, the most common patent that a packaging professional applies for is the utility patent. Although, it may be necessary to apply for both design and utility patents concurrently, if the function and overall appearance of the product are of importance.

History

Patents have been in existence since the 1790s and have developed parallel to society. The first patent was issued to William Pollard of Philadelphia, in 1790, for a machine that roves and spins cotton. Since then, the United States Patent and Trademark Office has issued nearly five million patents. Below are previous patents that have been issued to the packaging industry.

- 1856, corrugated or pleated paper (Healey and Allen)
- 1866, tin can with key opener (J Osterhoudt)
- 1871, corrugated as a shipping material - 1874 improved

- 1927, aerosol can
- 1952, bar code issued (Joseph Woodland and Bernard Silver)

Trade-Dress Protection Disappears

Trade-dress protection was established by the 1946 Lanham Act and states that functional features never qualify for trade-dress protection (Barlas, 2001). Professionals in the packaging industry agree that this would pose a problem considering that the function of the package is quite important. Court rulings will give explanation to why the disappearance of trade-dress is hurting the packaging industry.

First, previous cases must be acknowledged reflecting the time when the court ruled in favor of trade-dress. This favoritism was seen approximately ten years ago in the ruling that protected the interior décor of a Mexican restaurant through trade-dress, regarding the case of Two Pesos, Inc. v. Taco Cabana, Inc., 1992. Three years later, as a follow-up to the above mentioned case, the court ruled that in given time customers will come to recognize a particular color on a product or its packaging as a certain brand. The Qualitex Co. v. Jacobson Products Co. case is a great example (1995). For instance, breakfast cereal companies that use too much purple in the design of their raisin bran package may be in violation. The effort could be associated with trying to develop a relationship between the quality of their imitation of raisin bran and that of the leader, Post, Raisin Bran. That would be a violation of Post's trade-dress.

The outcome of these two court cases emphasizes the idea that trade-dress is easy to come by. However, it will become quite apparent that there is a problem with patented packaging, as further cases are presented.

The Courts Fall-out

The court backlashed and decided that it would be difficult for a company to claim a product design was protected by trade-dress in this ruling. The case involved a children's clothing manufacturer, Samara,, who was suing Wal-Mart, for the sale of several knock-off outfit designs (Wal-Mart Stores, Inc. v. Samara Brothers, March 2000).

In this case, Samara argued that Wal-Mart was causing confusion by selling these imposter knock-offs, which brought it under the Lanham Act. However, the ruling in the courts did not go according to the Lanham Act. The court ruled that Samara had failed to show "secondary meaning" for consumers. This meant Wal-Mart customers associated the knock-off designs with Samara's designs in the same way people associated the Coke bottle with Coca-Cola (Barlas, 2001).

The Wal-Mart decision concerning packaging was more implied than stated. It separated product design from product packaging and said that as far as design goes, a company would have to show "secondary meaning" to qualify for this trade-dress protection.

Parallel to the Wal-Mart v. Samara court case, the court again ruled that after a utility patent runs out, the company cannot then keep competitors from using a packaging design by threatening to sue them for theft of "trade-dress." (Traffix Devices, Inc v. MDI, Inc.) The meaning of this ruling essentially stated that if a company employs a patent protection against copying, it cannot later try to use trade-dress for the same protection once the patent expires (Barlas, 2001).

According to Justice Kennedy in Packaging Digest, "The design or packaging of a product may acquire a distinctiveness which serves to identify the product with its manufacturer or source; and a design or package which acquires this secondary meaning . . . is a trade-dress which may not be used in a manner likely to cause confusion as to the origin, sponsorship or approval of goods" (2001).

Another Fall-out

In the following case, MDI sued Traffix, alleging infringement of trade-dress because Traffix had reverse engineered the dual spring mechanism that MDI used on its traffic signs. MDI's argument was that the dual spring was distinctive and consumers identified with it, making it eligible for trade-dress. In parallel with the lawsuit, MDI's two utility patents had expired. The federal court, after learning that the patents had expired, ruled against MDI, disputing that the utility patents proved functionality, so trade-dress assistance was unavailable (Barlas, 2001).

In an earlier lawsuit, MDI forced one company out of business after a successful infringement suit, which claimed the competition infringed upon MDI's patent because the company's product served the same function. After winning this lawsuit, MDI argued that the mechanism had a distinctive appearance. But MDI was not as lucky as they were in the prior case because the Supreme Court stated, "You can't have it both ways, . . . the more aggressive you are with your patent claims, the more difficult for you to seek trade-dress protection."

This decision found another reason to emphasize that a product design had to be more than just distinctive to be protected by trade-dress. The design had to be non-functional too. Moreover, it explained that a utility patent is very strong evidence of functionality.

Invention: Novel or Non-Obvious?

Often it is hard to verify whether an invention is novel or non-obvious. The examiner reviewing the patent determines the novelty and obviousness of a patent. Each patent examiner has a various number of patents that can be compared to the existing patent which gives rise to another problem with patented packaging; words do not exist to show if the patent is novel or non-obvious.

Idea Gaps in Patents

Most patents are narrower, when read carefully, than they sound at first (Gleick, 2000). Such as measuring breasts with a tape measure to determine bra size (U.S. 5,965,809) and executing a tennis stroke while wearing a kneepad (U.S. 5,993,336). Would one not consider these obvious patents?

The conversion of invention to words allows for unintended idea gaps that cannot be satisfactorily filled (Greenburg, 2002). Often if the invention is novel, words do not exist to describe it. The reason for this according to Justice Kennedy is that "things are not made for the sake of words but words for things." Most of the time there are two meanings to everything. If two people look at one picture they both may see two very different images, just as with patents. What one examiner may see as novel may be different from what the judge who bears the decision may think.

Dating back to 1851, the Supreme Court invalidated a patent on doorknobs made of porcelain or clay, arguing that the substitution of these materials for wood was obvious (Hotchkiss v. Greenwood). Non-obviousness must be present for a patent to be valid, as practiced in this case. The decision was based on the improvement being made by a skilled mechanic, not an inventor (Hunt, 2001).

In 1952, as stated previously, Congress amended the Patent Act to include statutory requirement (Hunt, 1999). With this amendment in place, guidelines were established which laid the groundwork for deciding if one's invention met the requirement of non-obviousness (Graham v. Deere).

The 1966 decision of Graham v. Deere invalidated a patent on a combined sprayer and cap used on bottles of household chemicals (Calmar, Inc. v. Cook Chemical Co). The elements of the sprayer had been developed by others but had never been assembled in this particular way, which made the use of automated bottling equipment possible and reduced handling costs (Hunt, 1999). Although this product became quite successful, which would have suggested that the invention was non-obvious, the court ruled the differences between the products design an that of preexisting ones were minimal (Hunt, 1999). To demonstrate that novelty lies in opinion, the District Court said, "To me this language is descriptive of an element of the patent, but not a part of the invention" (Calmar, Inc. v. Cook Chemical Co).

With these two decisions stated, it is clearly shown that the courts decide upon whether one's patent is non-obvious.

The Incentive to Invent is Diminishing

Another problem with patented packaging is whether or not there is an incentive to invent. The infringement process gives support that there is not an incentive to invent. Infringement is the unauthorized making, using, or selling of a patented invention within the United States. There are two problems with the infringement process. First, when finding infringement, it is up to the patentee to remain up-to-date with the current technologies and locate the infringed upon claims. Second, is the cost associated with finding infringement (Dawson, 2001).

Patentee Rights Same as Infringer

The first of two problems associated with the infringement process and the diminishing incentive to invent are the options given to the patentee. The patentee does not receive many options when it comes time to collect damages. However, the accused infringe is given many opportunities to defend their case. In order for the patentee to receive any damages, there must be proof that the accused infringer had notice of the patent. Notice can be in the form of a letter to accused infringer, marking on the product or package (pat or patent), or filing an action of infringement. Even though there are three ways for the patentee to send proof to the infringer, the best way is by marking the product or package. A letter to the accused infringer may not be beneficial for jurisdictional reasons. Why is this? The infringee may bring a declaratory judgment against the owner of the patent in an unfavorable jurisdiction to the patent owner. Also, the patent owner has is the right to collect monetary damages to compensate for infringement.

The defense options that the accused infringer has are filed as followed; the accused infringer may claim that there is no infringement at all. The accused may attack the validity of the patent and its claims. And, the accused may also use prior art that the examiner did not use when issuing the patent. This proves that that the invention was obvious to one skilled in the art at the time of filing for the patent protection.

Cost

The second reason that there is little incentive to invent is the cost associated with the infringement process. Patent suits tend to be long, complex, and are usually filled with expensive legal testimony. When a company or individual files an infringement suit, it could then lead to civil action brought in the Federal Court, where an expert legal witness is needed. Expert legal witness fees can and will vary. The fees range from about $150 to $500 per hour, depending on the area of expertise. The average patent infringement suit costs around $1.5 million (Dawson, 2001). This cost takes into account, according to an attorney from Kirkland and Ellis in Chicago, that most infringement suits are usually settled before they are brought before a Federal court. Actually, only 6.9 percent of all patent infringement lawsuits over the last 20 years made it to trial; and in the year 2000, $4.2 billion was spent on legal fees to litigate patent infringement lawsuits (Pearl Ltd, 2000).

Other fees may be encountered, Figure 1 shows estimates acquired from Neustel Law Offices:

Figure 1:

Patent search (includes copies of located patent)	$400
U.S. Search & Patentability Opinion	$600
U.S. Patent Application (includes professionaldrawings)	
Mechanical	$3,500
Electrical	$6,000
E-Commerce	$8,000
Software	$8,000

Neustel Law Offices, LTD

Here's an example of how a patent infringement suit can play out in the patent process. Perhaps you invent a new way to package potato chips that can be exploited and earn you $1 million. However, your research costs $800,000. Thus, your new package has a commercial value of $200,000. If the invention turns out to be especially innovative, it may spawn improvements and further technological progress. This value is the social value. So you will have at least $200,000 profit without factoring possible litigation costs. Now assume you pursue a couple of small litigation cases that amount

to $300,000, this leaves you at –$100,000, which makes you aware that there is no incentive to invent, despite the positive commercial and social values (Dawson, 2001).

Conclusion

The materials mentioned above relate to the problems with patented packaging, and are only a few of the misconceptions within the patent system. Another problem related to the patent system is the legal game played by companies as a defense mechanism. New developments in patents are not marked by considerable originality (Correa, 2002).

These problems have addressed how patented packaging is affected by everything that occurs within the patent system, whether it is directly or indirectly related to packaging. Such problems can be seen in the case Two Pesos, Inc. v. Taco Cabana, Inc., 1992, where trade-dress was allowed in the interior décor of a Mexican restaurant, which meant that the packaging of a product could also be protected.

Research and evidence imply potential problems with patented packaging. Solving these problems will give protection to what needs to be protected. It will give protection to our novel ideas, and will save time and money.

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Tapping India's Rural Market

Sara Huhmann
Undergraduate Student, Packaging

Introduction

Ten years ago, foreign consumer products were scarce in India and only available to the affluent. Import restrictions prevented or severely hindered foreign consumer goods from entrance to India. With the economic liberalization that ensued, foreign brands are now prevalent across India (Luce, 2002). Today, multinational corporations view emerging markets such as India as prime opportunities for growth. According to Shanthi Kanaan, writer for The Hindu, rural markets are growing twice as fast as the urban markets (2001). With a rural population equal to just under 2.5 times the population of the entire United States as of the 2000 census, the potential consumer base is astounding. But generally speaking, success in India's rural markets for multinational corporations has been mediocre at best. It is from these struggles and failures, however, that multinational corporations seeking to enter the rural Indian market can learn how to do so more wisely.

Kellogg's, is an excellent example of a company that has struggled in the Indian market. Kellogg's entered the Indian market in the mid-1990's. They had the intentions of finding a new market, which would consist of over a million people, many of whom did not eat cereal. What Kellogg's discovered was that they were introducing a completely new product category. This meant they would have to invest large sums of money to create new eating habits in consumers. The most common Indian breakfast consists of biscuits and tea (Dawar and Chattopadhyay, 2002). While Kellogg's was busy creating new eating habits, local competitors were able to snatch away portions of India's already small cereal market by introducing local cereal flavors at lower prices (Prahalad and Lieberthal, 2003). The unimpressive sales that followed in their first three years resulted in Kellogg's needing to completely realign their marketing to meet local needs as well as introduce a line of inexpensive breakfast biscuits. Disappointments like this have caused companies who seek to enter the rural Indian market to reevaluate their entire approach.

Understand the Rural Market

With a population already in excess of one billion people, India has caught the eye of multinational corporations across the globe as a place of opportunity for exploring new markets. While India has portions of their population that would be considered wealthy or middle class by Western standards, a much greater percentage of India's population is low income. As a result, they spend money, live, and use products differently than the countries where most multinational corporations originate (Prahalad Lieberthal, 2003). Rural areas, in particular, exemplify these differences. Understanding the characteristics that make the people and the market in rural India unique can help corporations to enter this market with success. The key characteristics define the term *rural*, determine the amount and flow of income, and determine the types of products and packages that are typically used in rural India.

Defining Rural

Seventy percent of India's population, or approximately 700 million people, live in rural areas (Moorthi, 2002). As of the 2000 census, this equates to just under 2.5 times the population of the U.S. A location is defined as rural if at least 75 percent of the population is agrarian. With such a large number of potential consumers, it is clear why multinational corporations would like to successfully penetrate the rural Indian market.

Rural Income

With an average income equivalent to $42 per month ($504 dollars per year), rural Indians have a very low disposable income (Kripalani, 2002). Most rural homes have minimal storage space and no refrigeration. Very few people own or have access to cars. As a result, rural Indian purchasing habits tend to be of an "earn today, spend today" mentality. Rather than buying in bulk, which would mean paying more for a large quantity upfront, rural Indians tend to buy what they need for short segments of time (Dawar and Chattopadhyay, 2002). These factors result in consumers buying products locally, as well as on a daily basis.

In addition to the fact that income levels are low, rural incomes also vary greatly depending on the monsoons. When a monsoon hits, this devastates the livelihood of most rural consumers because they are dependent on agricultural work for income. Corporations are also directly affected because this makes it difficult to predict demand (Kanaan, 2001).

Products and Uses

Before a company considers entering the rural market, understanding the types of products and packages that rural Indians typically use is crucial. For example, urban Indian consumers would typically use toothpaste for brushing their teeth, while most rural Indians prefer using tooth powder (Balu 2001). As a company seeking to enter India's market with an oral care product, this would be an important fact to know and consider during both the product and package development stages. Similarly, Hindustan Lever Ltd. (HLL), the Indian subsidiary of Dutch-based Unilever, discovered that rural Indians tend to use the same soap for washing everything from hair to their

bodies to clothing (if they use any soap at all). Because HLL manufactures products including various soaps and detergents, HHL product and packaging development processes have taken this rural habit into account by designing all-in-one soaps (Balu, 2001). By taking into account the low disposable incomes and the unique product and package needs of this market, consumer products that are designed and packaged for this market have great potential.

Strategically Align with Industry

Another key aspect to consider is how and where to produce and package the product. There are several options when a company is attempting to strategically aligning with industry. Companies can partner with an existing Indian company, buy out a local Indian manufacturer of a similar product, or strictly import products into India while keeping manufacturing facilities elsewhere.

Partnering

The first and best option for aligning with the Indian industry is for the multinational to partner with an Indian company that is already successfully producing and selling a similar type of product. In doing so, the new company can take advantage of the manufacturing facilities and distribution networks that are already in place rather than having to start from scratch. As a result of India's colonial experience when it was controlled by Britain, many Indians have "...a profound mistrust of foreign brands" (Luce, 2002). By creating a partnership with an Indian company plays down the foreign factor and helps to dispel some of this mistrust.

Hindustan Lever is a multinational corporation that has found success with this method of aligning with industry. By partnering with local entrepreneurs who own and manage their own plants, Hindustan Lever is able to manufacture their products with minimal amounts of fixed capital. In these partnerships, the entrepreneurs agree to devote their plant's capacity to manufacturing only Hindustan Lever products (Prahalad and Liebethal, 2003).

Buy-Out

A second alternative for aligning a new industry to enter India's rural market is to buy out a local Indian manufacturer. As with partnering, buying out a local manufacturer gives a company the ability to capitalize on existing manufacturing facilities and distribution networks. The disadvantage is that Indian consumers may view this negatively. Coca-Cola is an example of a multinational corporation that tried buying out a local distributor. In 1992, Coca-Cola made its second appearance to the Indian market. In an attempt to eliminate its biggest competitor, Coca-Cola acquired Thumbs Up, the local market leader in cola. When Coca-Cola tried to exchange its own brand on the regular Thumbs Up distribution network, Indian consumers looked unfavorably upon Coca-Cola. The company has been struggling ever since (Luce, 2002).

Importing

Additionally, companies can enter India's rural market by importing products from manufacturing locations overseas. Importing has only been a viable means of get-

ting consumer goods into India for just over ten years, when trade restrictions were eased (Luce, 2002). However, there are several disadvantages to this method of marketing to rural India. Without a manufacturing facility in India, a company has no ties to India's already challenging distribution network, thus making sales even more difficult. In addition, Indian consumers tend to feel more loyalty and trust toward locally made products. The aforementioned Thumbs Up and Coca-Cola scenario also illustrates this fact. Though Thumbs Up is a cola of lower quality that Coke, it is a locally made Indian brand that rural consumers can relate with. Consequently, Coca-Cola is third behind Pepsi and Thumbs Up in the Indian soft drinks market (Luce, 2002).

Partnering with or buying out an existing Indian company, as well as importing from overseas, are all viable ways to get packaged consumer goods into rural India. Based on the past experiences of multinational corporations entering the market, partnering is the most successful option.

Tackle the Distribution Networks

Distribution networks in emerging markets tend to be very unique and often times disjointed (Dawar and Chattopadhyay, 2002). India is no exception. Before a multinational corporation even considers entering India's rural market, it is important to first get an understanding of the current distribution system characteristics as well as the ways that the system is likely to change over time (Prahalad and Lieberthal, 2003). In doing so, a company can assess whether or not accurate and timely product distribution can be achieved without first investing in the distribution networks. Some of the characteristics unique to rural India's distribution networks include the modes of transportation used as well as the point of sale. Despite the challenges of the rural Indian distribution environment, there have been distribution successes from multinational corporations.

Modes of Transportation

Over three million retail outlets in India are reached by companies that produce packaged goods. Methods of transportation used include camels, bull-drawn carts, bicycles, trucks, and trains (Prahalad and Lieberthal, 2003). In addition, poor roads and unreliable electricity are two additional obstacles common to the distribution networks in rural communities (Kripalani, 2002). Though glass bottles are popular in India, breakage can be a serious problem when the glass is carried over bumpy roads in the back of a truck (Prahalad and Lieberthal, 2003). Companies must be prepared to design packages for their products that will be capable of withstanding these types of conditions.

Point of Sale

The retail establishment where most rural consumers purchase their day-to-day goods is at a kirana or street shop. These small open stalls line the streets and are approximately the size of a living room. Consumers purchase everything from bananas to razors at a kirana. With over 2.5 million kiranas throughout India's rural towns and villages, keeping store shelves stocked is one of the main challenges to consumer goods manufacturers (Bullis, 1997). In order to reach these local shops and establish a brand

presence in them, companies need substantial amounts of working capital and a large committed sales force (Dawar and Chattopadhyay, 2002).

Success Stories

In spite of all the distribution challenges, there have been several multinational corporations that have experienced great successes in tackling the distribution networks. Hindustan Lever has been able to build a distribution network in India that directly serves 800,000 stores and uses wholesalers and distributors to reach another 3.5 million outlets (Dawar and Chattopadhyay, 2002). Not only does this help Hindustan Lever move products from manufacturing facilities to retail outlets, it also provides a large deterrent to potential competitors.

In addition to the distribution networks that reach local stores in India, Hindustan Lever began using an experimental concept called Shakti distributors. They implemented this tactic in 2000 to get their products into some of the most remote rural areas (Balu, 2001). Douglas Bullis calls this a multilevel marketing system, where independent distributors sell products directly to consumers and earn a commission on the products they sell, plus for other distributors they recruit (1997). It is similar to the way Amway and Mary Kay distribute products in the U.S. Shakti distributors are rural Indian women who partner with Hindustan Lever to receive training in micro-business skills, which includes a Personal Digital Assistant (PDA) to access product prices. They purchase HLL products at cost and sell them to their villages for a profit. This unique method of distribution gets products beyond the typical reach of HLL's distribution networks (Merchant, 2003). In spite of the unusual modes of transportation and the challenge of supplying small kirana, creative distribution methods have produced success for several multinationals in the rural Indian market.

Create the Packaging Solution

When approaching the task of designing a package for the rural Indian market, all of the aforementioned factors must be considered. Multinational corporations that have been successful with marketing and packaging consumer products for rural India have taken time to research the target market. They built an insightful and unbiased understanding of the characteristics that make it unique (Prahalad and Lieberthal, 2003). As a result of this research, two of the most effective elements of a package designed for rural India include the size and visual communication. Material usage is also another important element for the packaging engineer to consider.

Think Small

Due to the fact that rural Indians have small disposable incomes and very little storage space, one of the most popular concepts to hit the rural market has been sachets. Sachets are plastic pouches that contain approximately 20 milliliters (.68 oz.) of product (Bailay, 2003).

Sachets were first introduced to India in the 1990's by an Indian company selling a 10-milliliter sachet of Velvette shampoo. Before the sachet, shampoo in India was only available in larger bottles, therefore limiting its sales success among people with small incomes (Moorthi, 2002). Sachets meet the needs of the rural consumer in several ways. Sachets are inexpensive, they occupy a small amount of space, and they allow consumers to experiment with new products that they may never have tried before (Bailay, 2003).

Coca-Cola is another company that has found success by thinking small. In a packaging change aimed directly at the rural and lower-income markets, Coca-Cola launched a new 200 mL (6.8 oz.) bottle for the equivalent of 10 cents in 2001 (Kripalani, 2003). After introducing the smaller size bottle, sales increased 34 percent by the end of the first quarter in 2002 (Kripalani, 2002). Packaging in smaller units clearly helps to increase the affordability of products for rural Indian consumers.

Visual Communication

The rural area is a market where large portions of the population are illiterate. So, when packaging consumer products for rural markets, companies must use prominent logo symbols and logo colors to assure that illiterate consumers will be able to recognize the products (Bullis, 1997). Therefore, communicating brand values through the package rather than with words becomes essential. Emotional Surplus Identity (ESI) is a concept that that uses the shape, color, and content of a package to differentiate a brand in the eye of a consumer. By creating a bond with the consumer through the package, companies are able to establish a relationship that encourages repeat purchases. Loud, bright colors are typically used on packages to differentiate a product from the others on the shelf and to create a lasting impression in a consumer's mind (Srivastava, 2003).

Another technique used by multinational corporations has been tailoring products, including changing brand names, to give them a rural image. In the eyes of the consumer, branded products are associated with quality and value. Nirma, the largest selling detergent in the world, found success in the rural Indian market by using unelaborate packaging to position their product as one that cleaned well yet was affordable (Bullis, 1997). While this technique is not the most eye-catching, it allows rural Indian consumers to experience the benefits of a branded product without requiring elaborate or expensive packaging on the part of the multinational corporation.

Material Usage

Cost is not only a factor that influences a consumer's decision. Multinational corporations also address cost when evaluating various packaging options. For example, meeting the needs of consumers by packaging products in small quantities increases the packaging costs for a company in comparison to a large bottle of prod-

uct. One way companies are able to keep the prices of sachet-type packages down is partially due to lower government duties on small packs. In some instances, it can actually be cheaper for a consumer to purchase sachets rather than a bottle of product. For example, a 100-milliliter (3.4 oz.) bottle of Pantene shampoo retails for 61 rupees whereas 100 milliliters worth of sachets sells for 40 rupees (88 cents) (Bailay, 2003). By thinking small, using pronounced colors and logos, and planning for material usage, multinationals can create packages that meet the needs of the rural Indian consumer.

Conclusion

With an approximate population of 700 million people, the rural Indian market is important for multinational corporations to tap. Although rural Indians need to purchase consumer goods just as their Western counterparts do, rural Indian consumers have a different set of needs that must be met by both package and product. Spending time researching the rural Indian consumer as well as the market before diving in can help to prevent unnecessary struggles and failures. If the opportunity exists, partnering with an existing Indian company upon market entry can provide several key advantages to a company. Understanding the available distribution networks in rural India is crucial to making a successful entry into the rural Indian market. Packages need to be designed to withstand more distribution abuse due to poor roads and more primitive modes of transportation. Finally, when creating a package for rural India, small sizes allow consumers to try new products. It also caters to the fact that most rural Indians have low disposable incomes and little storage space at home. By applying these lessons that have been learned from multinational corporations in the past, the task of entering the rural Indian market should be promising.

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Expel, Pink Truck and Rodents

Amanda Dobbratz
Undergraduate Student
Artist Statement

The main themes of my current paintings have evolved three-fold. The unofficial working title to these ideas is Mastication, Masturbation and Menstruation; that is to say, consumption, overindulgence and reproduction. My primary interest is to explore gender stereotypes projected by contemporary culture, specifically with respect to the confused roles of the sexes in post-feminist times. This relates directly to copulation. Also, I generally utilize visual and linguistic puns as a method to illuminate my strategies.

The types of metaphors in my work are a form of iconoclasm. I exploit the traditional meanings of commonplace objects and pervert them to my cause. I am interested in words, phrases and objects with elements of humor that are used colloquially to describe genitalia or relate to their appearance or function. I find humor a compelling, and often undervalued, means of communicating in art. By using a lighthearted approach, I believe my audience is more receptive and open to the gravity of my subject matter.

Recently, I have been exploring uses of paint and non-paint materials, and researching untraditional applications of these materials in my work. Some of these processes include pooling and squirting of paint, as well as application of elements like glitter, plastic sheeting and patterned papers. Working in this way enables me to think beyond the confines of traditional painting and reconsider the inherent connotations these materials possess.

For example, in the piece Pink Truck, the spattered white areas have a seminal quality that references male virility, while the pooled gloss pink on top of these areas sabotages this potency. The wood-grained contact paper, a moveable material, I believe renders traditional masculinity false. These elements represent the dichotomy men and women face when assuming contemporary gender roles.

Expel uses patterned tissue paper as an organizational and unifying device. The honeycomb pattern of the paper alludes to the hexagonal structure of sex hormones. As in Pink Truck, irregular areas of white paint represent male sexuality. The form of the gas pump was chosen for the implications of its function and appearance.

I also collaborate with my sister, Michelle Dobbratz, under the name Dick Mernilia Randolph. We assembled the name from our parents' hometowns and the first names of each of our grandmothers. Together we work using child-like line drawings and text in the form of slogans and labels. We play with the idea that very simple images actually carry complex information and represent reality in the form of icons or logos. For the most part, this body of work's imagery is loosely derived from the animal

kingdom, insect world, and the "five elements"; water, metal, wood, fire, and earth.

Our piece, Rodents/Iconoclasts explores the associations given to members of the rodent family. The slogans beneath the animals reflect common and pop-culture association given to them. We are also interested in the role technology plays in the timeline of human development. As in my independent work, humor, contemporary iconography, culture and stereotypes play an important role in our experiments.

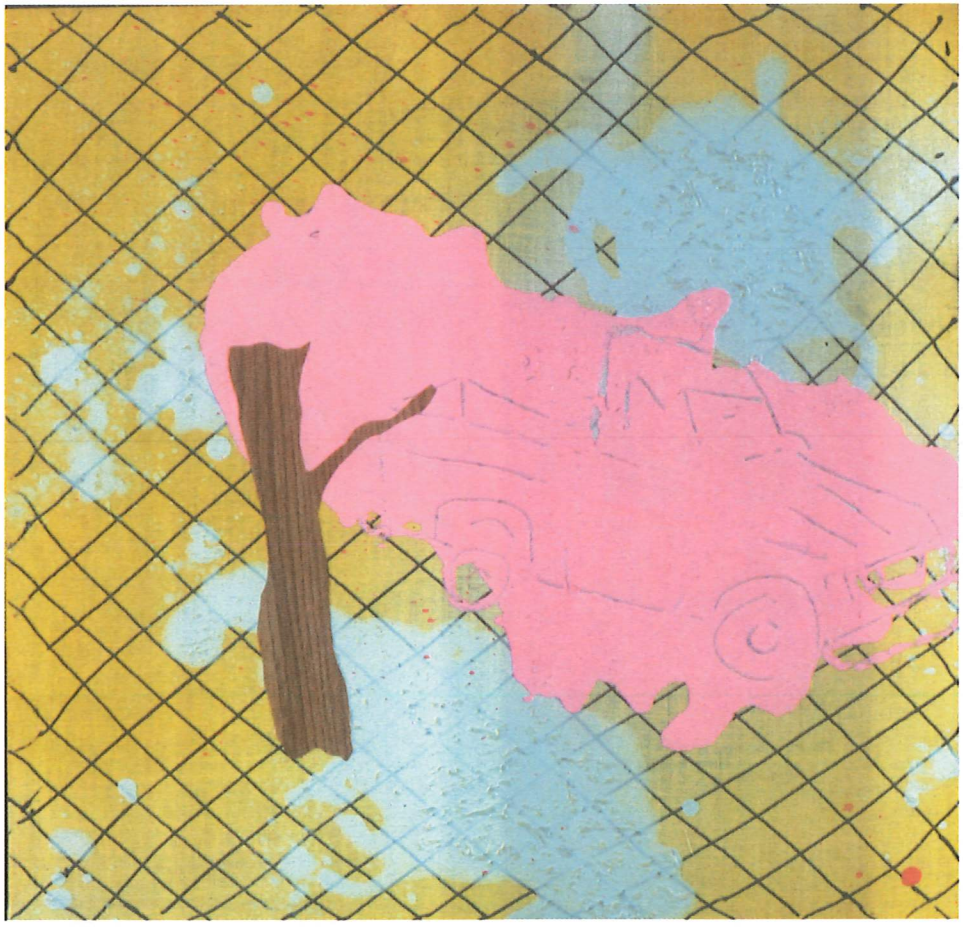
A. Dobbratz

"Rodents/Iconoclasts"
2003

Oil on Canvas

A. Dobbratz

"Pink Truck"
2003



Acrylic and Contact Paper on Linen

A. Dobbratz

"Expel"
2003

Acrylic and Oil on Tissue paper on Muslin

Manuscript Preparation

Cover Sheet and Abstract

The cover sheet should include the following information: title of the article submission (not exceeding 60 characters), student authors name, department affiliation along with academic standing (i.e. Sophomore, Graduate Student). The faculty research advisors name and signature should also be located on this sheet. Excluding the article title, none of the former information should be found anywhere else in the article submission to ensure anonymity during the blind review process. The cover page should also include pertinent correspo dence information such as local and permanent address, local telephone number, and email address. The contact information will not only be used during the editing and revision stages but will be used to send those authors whose submissions are accepted for publication their two complimentary copies of the Journal of Student Research.

The following page should include the article title at the top of the page fo llowed by the abstract of the submission. This abstract should be used as an opportunity to give the reader a preview to the article and what conclusions were reached due in part to the contributions of the research. The abstract should be about 125 words but not exceeding 175 words. Following the abstract should be eight to ten key words or phrases that will be used for various bibliographic services.

Text and Style Layout

Submissions considered for publication must be double-spaced in 12-point Times or Times New Roman font, following the standard 8.5 x 11 page margins, and be completedusing the Microsoft Word format. No specific length of man uscript is required but a 3,500 word (14-page) maximum should be recognized in this particular format. The body of the article should follow a clearly organized order of information presentation and can be written in either past or pre sent tense as long as the manuscript is consistent with American Psychological Association (APA) guidelines. Included in each submission should be a clearly defined introduction, main body, and closing remarks. The heading for each of these subsequent sections along with what information is presented within each section is dependant upon what is considered appropriate research for the author's corresponding field of study. It is at the discretion of the primary researcher and their selected faculty advisor to decide this information.

Tables and pictures are encouraged and they should be prepared precisely for submission as they are to appear in the Journal. Tables should be easy to read, clearly labeled with a brief, to-the-point title, and should be limited to not more than 5 tables or graphs in one submission. Pictures need to be saved in .EPS or. TIFF format so that they have the best resolution possible and their effectiveness is not compromised during the production process. Graphs, charts, and photos should be constructed using, but not limited to, the Adobe Acrobat System, either Illustrator or Photoshop in any version, to preserve consistency throughout the Journal.

References

A comprehensive citation of references needs to follow the conclusion of the article

using the latest version of the American Psychological Association (APA) guidelines. The APA guidelines will also assist the researcher in properly locating graphs, charts, or photographs within the research article and then identifying them within the text. As the University of Wisconsin Stout is a diversified university with numerous disciplines of knowledge being practiced, alternative methods of reference formatting will be accepted if the researcher's particular academic major does not utilize APA as its primary method of educational reporting. For those submissions that are not following APA format, the format that is being used should be clearly annotated following the author's academic standing on the cover page of the manuscript.

Procedures for Submission

The Journal of Student Research accepts submissions throughout the entire year, including Winterm and Summer Session Periods. For an article to be included in the 3rd edition of the Journal the deadline will be December 20, 2003. There will also be a spring deadline of May 20, 2003 for those students who will be graduating and would like to submit their research for academic review during the summer/fall sessions. Article submissions should be in a hard copy format with all subsequent information included. Accompanying the hard copy should be an exact electronic copy (on 3.5 diskette or ZIP disk) that must be included in the manuscript packet. The electronic version should be comprehensive in the fact that all tables and charts be included in the article body and not found in separate files or folders. The University of Wisconsin Stout requires that all students engaged in research involving human subjects or using data derived from human subjects to obtain the approval of the Institutional Review Board (IRB). Training and submissions material along with contact information can be found at the Research Services web page
http://www.uwstout.edu/rps/humnsubj.htm. To keep with university policies concerning research it will be mandatory that proof of the training/IRB approval be included in the manuscript packet before acceptance of the article submission can take place. Authors will be notified of article acceptance in February and will have the opportunity to review/revise their submissions as suggested by faculty reviewers before the article goes into production. The editor reserves the right to alter submissions to fit the format thathas been laid out for final production purposes.

To submit your manuscript packet you can drop the packet off or send it through inter campus mail to:

Research Services
152 Vocational Rehabilitation
Journal of Student Research

If your are located off of campus and would like to send in your manuscript packet, the address is as follows:

University of Wisconsin Stout
Research Services
c/o Rebecca Meyers, Editor
152 Vocational Rehabilitation
Menomonie, WI 54751

If you have any questions concerning article submission guidelines or standards, contact the Editor at meyersr@uwstout.edu

Journal of Student Research-University of Wisconsin-Stout Reviewer Form

Adapted from: UW-Madison Journal of Consumer Research Reviewer Report Form at http://wiscinfo.doit.wisc.edu/jcr/RRF2.htm. Last accessed on 12/21/03.

A. Importance of topics/issues to the specific field of study Score: _____

Unimportant	Trivial	Modest	Important	Extremely Important
1	2	3	4	5

B. Quality of writing and other presentations (figures, tables, exhibits) Score: _____

Completely Inadequate	Major Problems	Minor Problems	Good	Superior
1	2	3	4	5

C. Conceptual rigor (clarity of objectives, treatment of relevant literature, logica reasoning) Score:_____

Completely Inadequate	Major Problems	Minor Problems	Good	Superior
1	2	3	4	5

D. Methodological rigor (research design, sampling, data collection/analyses as relevant to qualitative/quantitative data) skip if NA Score:_____

Completely Inadequate	Major Problems	Minor Problems	Good	Superior
1	2	3	4	5

E. General discussion and conclusions (implications, limitations, future research) Score: _____

Completely Inadequate	Major Problems	Minor Problems	Good	Superior
1	2	3	4	5

F. Paper's contribution to research in its current form Score: _____

None	Trivial	Modest	Important	Pathbreaking
1	2	3	4	5

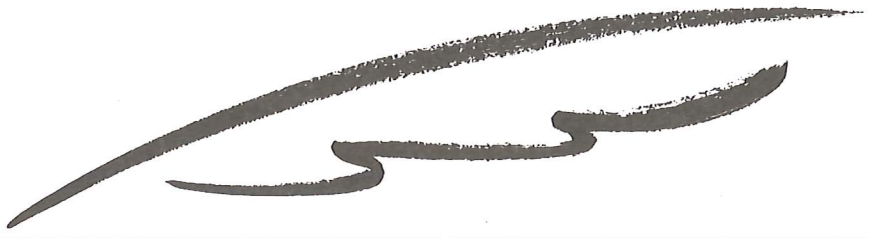
G. Contribution if revised according to my accompanying comments Score: _____

None	Trivial	Modest	Important	Pathbreaking
1	2	3	4	5

H. Recommendation Score: _____

1. Reject unconditionally, because the likelihood of a successful revision is remote
2. Reject in current form, but allow resubmission of a substantially different version, according to my accompanying comments
3. Encourage revision, according to my accompanying comments
4. Accept conditionally, subject to minor revision, according to my accompanying comments
5. Accept unconditionally

I. Comments: Please provide clarification for scoring and any additional comments or suggestions in the space provided below.



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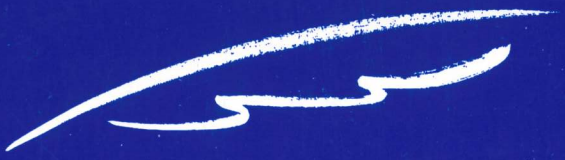

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